Boughs of American Woods

Part IX

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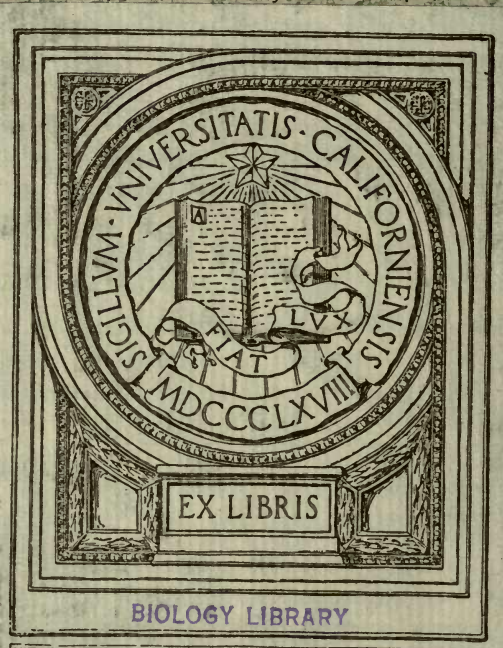

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Hough's American Woods.

Part IX.

THE

AMERICAN WOODS,

EXHIBITED BY ACTUAL SPECIMENS

AND WITH COPIOUS EXPLANATORY TEXT,

BY

ROMEYN B. HOUGH, B. A.

PART IX.

REPRESENTING TWENTY-FIVE SPECIES

BY

TWENTY-FIVE SETS OF SECTIONS.

LOWVILLE, N. Y., U. S. A.
PUBLISHED AND SECTIONS PREPARED BY THE AUTHOR.
1903

WEED-PARSONS PRINTING CO.,
ELECTROTYPERS AND PRINTERS
ALBANY, N. Y.

TO

Mr. Gifford Pinchot,

FORESTER, U. S. DEPARTMENT OF AGRICULTURE,

PART IX, AMERICAN WOODS,

IS DEDICATED AS AN EXPRESSION OF HIGHEST ESTEEM.

PREFACE TO THE SERIES.

The necessity of more generally diffused information concerning the variety and importance of our forest trees is justification enough for the appearance of this work, especially at this day, when the demands of Forestry in this country are constantly more and more keenly felt. The work was undertaken at the suggestion of my father, whose intense interest in Forestry, and a kindred taste, at once gave me inspiration to the work. It was entered upon with the expectation of his valuable companionship and counsel during its progress, but, alas ! that I was destined to have only at the outset, and, while I was then left ever to mourn the loss of a kind father, companion and teacher, the reader must fail to find in these pages that value and finish which his mind would have given them.

Among the happiest pictures of my memory are those in which I see my father's delight, as I would show to him, from time to time, my successful progress in devising a way of making the sections for this work, and if only for the happiness which its appearance would have caused him, could he have lived until this day, I have felt duty-bound to go on with it, even though left to do it alone.

The work is the outgrowth of one, of somewhat similar plan, proposed by my father some years since, but which he did not carry into effect. Its design is primarily and principally to show, in as compact and perfect a manner as possible, authentic specimens of our American woods, both native and introduced. For that end three sections, respectively transverse, radial and tangential to the grain (see Glossary), are made of each timber, sufficiently thin to allow in a measure the transmission of light, and securely mounted in well made frames.

The three planes above mentioned show the grain from all sides, so to speak, no plane being possible but that would be either one of them or a combination of them. The difficulty, however, of cutting a great number of sections exactly on those planes is obvious, so let it be understood that the terms, "transverse," "radial" and "tangential," are, in many cases, only approximately exact in their application.

My endeavor is to show, either in a part or all of the sections standing to represent a species, both the heart and sap-wood, but with some woods

as the Sumach, for instance, where usually only the outermost ring, or a part of it, could be said to represent the sap-wood, the display of that is quite impossible. In certain other woods, as the Spruce, etc., the transition from sap to heart-wood is almost indistinguishable by any difference in color, and, although both may be shown in the sections, one can scarcely distinguish between them.

The sequence of the numbers given to the various species is of importance only to show the botanical arrangement within a given Part, each Part being independent of the others.

The text of this work has been added rather as a secondary matter, to supply to those not having it in other form, such information as is of importance, in connection with the wood specimens, to give a fairly good acquaintance with the trees represented. It contains little, if any thing, new to the botanist, but to others it is hoped it may be of some value.

In its preparation some use has been made of my father's Elements of Forestry, and thanks are due the publishers of that work — Messrs. Robert Clarke & Co. of Cincinnati, Ohio — for the use of cuts in reproducing a number of its illustrations. Other valuable books of reference have been the works of Drs. Gray, Wood and Bessey, LeMaout and Decaisne's Descriptive and Analytical Botany, Prof. C. S. Sargent's Report on the Forest Trees of North America (constituting Vol. IX, Tenth Census of the United States, 1880), Micheaux and Nuttall's North American Sylva, George B. Emerson's Trees and Shrubs of Massachusetts, D. J. Browne's Trees of America, etc.

The authenticity of the timbers represented in this work has been a subject of personal attention and special care on the part of the author. The trees selected for specimens have been identified in the field, before felling, while the leaves, flowers or fruit (one or more) have been obtainable, and he can, hence, vouch for the authenticity of every specimen represented.

Succeeding Parts, uniform in style with Part I, and representing in each case twenty-five additional species, are planned to appear later, with the ultimate end in view of representing, as nearly as possible, all of the American woods, or at least the most important, in such a series of volumes as this one.

Upon the reception which this meets in public favor, and upon the co-operation of those interested in the cause, must naturally depend the carrying out of that plan. It is hoped that greater experience and skill will enable us to obviate in future parts the faults which occur, from lack of those qualities, in this.

Notice of errors in this work will be thankfully received in hopes of profiting therefrom in the future.

LOWVILLE, N. Y., *March* 30, 1888.

PREFACE TO PART IX.

In American Woods, Part IX, we have the fourth installment of the woods of the Pacific slope. Its publication has been retarded somewhat by demands upon our time for the considerable amount of field work necessary for the commencement of the publication of our proposed Tree Studies. This is to be a companion work to American Woods, intended to meet a demand for which American Woods is inadequate, viz.: illustrations of the trees themselves and their characteristic barks, leaves, flowers and fruits.

The lack of that feature in American Woods has from the first been appreciated, but the art of modern illustration was in its infancy when American Woods was conceived. The production of such pictures as we are now able to make was then not thought of, save perhaps in the fancies of the pioneer inventors. The wonderful progress these benefactors have made, and the extensive opportunities the writer has had for the field study of our trees in their native haunts, from the Atlantic to the Pacific, have rendered possible the production of the plates which we are glad to present in Tree Studies, and which we trust will please our friends who have urged their appearance.

An announcement of Tree Studies follows at the close of this volume, to which the attention of the reader is invited.

In the production of American Woods, Part IX, I wish especially to acknowledge with gratitude the assistance rendered by Miss Alice Eastwood, of the California Academy of Sciences; Prof. E. S. Meany, of the University of Washington; Prof. W. R. Dudley, of Stanford University; Prof. Chas. H. Shinn, of the University of California; Mr. J. H. Barber, Director Paso Robles Agr. Exp. Station; Mrs. Sarah P. Cooper, of Elwood, Cal.; Mr. S. B. Parish, of San Bernardino, Cal., and others whose company in the fields of their respective regions have contributed greatly to the pleasures of my collecting trips, as well as offering invaluable assistance.

In regard to the subsequent parts of American Woods, it might be said that Part X is already in advance preparation, and considerable material is in hand for Part XI. The appearance of the former at least during the coming year can be assured, and the rest of the series will follow as rapidly as possible.

Lowville, N. Y., *Dec.* 30, 1902.

A KEY BASED UPON THE LEAVES,

Designed as an Aid in identifying the Species represented in Parts I to IX inclusive, when out of Season for procuring the Flowers.

N. B.—As this key applies only to the species thus far represented in AMERICAN WOODS it is important always to confirm identification by applying the more detailed description given in its proper place.

a. **Deciduous Leaves.**—falling in autumn.
b. *Simple Leaves.*
c. Laminate—with well marked blade and petiole.
d. Main rib single—pinnately veined.
e. Entire or nearly so, pointed at both ends and
f. Opposite
3–5 in. long, thick, lustrous above..... 9. NYSSA MULTIFLORA.
5–6 in. long, thin, dull above..... .....89. CATALPA BIGNONIOIDES.
*f*². Alternate, thinnish and in length
g. 6–12 in.
Oblong, petioles ½ in..... 1. MAGNOLIA ACUMINATA.
Lance-obovate; petioles, scarcely 2 in. long.....76. ASIMINA TRILOBA.
*g*². 2–7 in.,
h. Thickish, and with light-colored pubescence, at least on the veins beneath.
Petioles about 1 in. long..... ...61. DIOSPYROS VIRGINIANA.
Petioles about ½ inch long..... .....110. NYSSA OGECHE.
*h*². Thinnish, oblong-obovate (often remotely serrate).
193. SALIX NUTTALLII.
*g*³. 1–3 in., distinctly bluish-green... .... 214. QUERCUS DOUGLASII.
*f*³. Alternate, opposite and scattered upon the same plant. linear.
134. CHILOPSIS SALIGNA.
*e*². Serrate, serulate or dentate.
f. Inequilateral and cordate or truncate at base,
g. Ovate-orbicular, large, 4–5 in. or more in length.
3. TILIA AMERICANA.
*g*². Ovate, long-taper-pointed from a broad base.
12. CELTIS OCCIDENTALIS.
*g*³. Ovate-oblong and
h. Very rough, especially above, rugose .....11. ULMUS FULVA.
*h*². Smoothish and
i. 2–4 in. long, fruit in
Fascicles..... .....33. ULMUS AMERICANA.
Racemes ....34. ULMUS RACEMOSA.
*i*². 1–2 in. long and only slightly inequilateral.
114. PLANERA AQUATICA.
Flowers and fruit in fascicles.....33. ULMUS AMERICANA.
Flowers and fruit in racemes..... .. ..34. ULMUS RACEMOSA.
*f*². Equilateral and obtuse, rounded or cordated at base.
g. Veins straight or nearly so, leaves thinnish.
h. Ovate-oblong.
Coarsely serrate with remote teeth, one at the end of each vein, ciliate and covered with silky white hairs.
16. FAGUS FERRUGINEA.

Doubly and sharply serrate, nutlet inclosed in a papery sac.
41. OSTRYA VIRGINICA.
Unequally and sharply serrate, nutlet subtended by a leafy bract.
42. CARPINUS CAROLINIANA.

*h*². Ovate and
i. Finely and closely serrate, smooth, whitish and reticulate-veined beneath . . . . . 47. POPULUS BALSAMIFERA.
*i*². Doubly serrate and
j. Thinnish; petioles downy and of aromatic flavor.
Bark of trunk yellowish-gray. . . . . 17. BETULA LUTEA.
Bark reddish-brown. . . . . 44. BETULA LENTA.
*j*². Thickish and bark white. . . . . 43. BETULA PAPYRACEA.
*g*². Veins incurved; leaves
h. Orbicular-heart-shaped, thickish, 4–8 in. long.
Acuminate. . . . . 63. MORUS RUBRA.
Obtuse or rounded at apex. . . . . 97. POPULUS HETEROPHYLLA.
*h*². Orbicular-ovate; petioles laterally compressed; leaves
Coarsely dentate. . . . . 18. POPULUS GRANDIDENTATA.
Serrate-dentate . . . . . 72. POPULUS TREMULOIDES.
*h*³. Broad ovate, acuminate serrate. . . . . 218. POPULUS TRICHOCARPA.
*h*⁴. Elliptical to obovate, conspicuously netted-veined, above.
Glabrous. . . . . 207. PRUNUS SUBCORDATA.
Hairy along veins. . . . . 126. RHAMNUS PURSHIANA.
*h*⁵. Ovate-lanceolate, pubescent beneath. . . . . 209. PYRUS RIVULARIS.
*f*³. Equilateral and acute at base, tapering both ways,
g. Narrow-lanceolate, very long-attenuate, tomentose on midrib above and petiole . . . . . 45. SALIX NIGRA.
*g*². Ovate-lanceolate to lanceolate, long-acuminate, 2–4 in. long; capsules
Sessile or nearly so . . . . . 46. SALIX ALBA var. VITELLINA.
With slender pedicels . . . . . 71. SALIX AMYGDALOIDES.
*g*³. Oblong-lanceolate to lanceolate.
h. Minutely serrulate, 3-7 in. long; petioles downy.
140. SALIX LAEVIGATA.
*h*². Serrate with teeth sharply
Awn-pointed and in about 20 pairs. . . . . 40. CASTANEA VESCA.
Mucronate and in 6-12 pairs. . . . . 68. QUERCUS MUHLENBERGII.
Finely glandular-serrate. . . . . 55. PRUNUS PENNSYLVANICA.
*g*⁴. Oblanceolate to lanceolate-oblong, puberulous beneath.
165. SALIX LASIOLEPIS.
*g*⁵. Obovate-oblong, serrate, hairy beneath; length
1–3 in., acute. . . . . 208. PRUNUS MOLLIS.
3–6 in., long acuminate. . . . . 56. PRUNUS AVIUM.
*g*⁶. Ovate; petioles.
Short, generally not more than ½ in. . . . . 163. ALNUS RHOMBIFOLIA.
Long; leaves very smooth and shining above. . 57. PYRUS COMMUNIS.
*g*⁷. Wedge-obovate, veins very prominent,
Thin, smoothish and dull above. . . . . 58. CRATAEGUS PUNCTATA.
Thick, smooth and lustrous above. . . . . 85. CRATAEGUS CRUS-GALLI.
*g*⁸. Ovate-oblong, veins incurved and petioles
h. With 2–4 glands, smooth. . . . . 29. PRUNUS SEROTINA.
*h*². Without glands,
Glabrous both sides, sharply serrate.
59. AMELANCHIER CANADENSIS.
Downy under-side and petiole. . . . . 30. PYRUS MALUS.
*g*⁸. Lanceolate oblong, 1–3 in. long, about equally acuminate at both ends.
111. FORESTIERA ACUMINATA.
*f*⁴. Equilateral and truncate at base,
g. Serrate-dentate with cartilaginous teeth
Deltoid-ovate, rather long taper-pointed. . . . 48. POPULUS MONILIFERA.
Deltoid-reniform, more abruptly pointed. . . 194. POPULUS FREMONTII.
Broadly deltoid. . . . . 73. POPULUS DILATATA.
*g*². Irregularly serrate or obscurely lobed. . . . . 70. BETULA POPULIFOLIA.
*e*³. Pinnately lobed; lobes at apex
f. Rounded (not bristle-pointed) and

g. Subequal, sinuses
Wide, lobes narrow and nearly entire; leaves 5–9 in. long.
38. QUERCUS ALBA.
Narrow, lobes wide and
mostly undulate or crenate-toothed; leaves 2–3 in. long.
160. Q. LOBATA.
Entire or nearly so and round or obtuse at apex.
136. Q. GARRYANA.
*g*². Very unequal,
h. The two lobes nearest the summit much the largest.
92. QUERCUS OBTUSILOBA.
*h*². Lyrate-pinnatifid and sinuses extending
Nearly to the midrib and roundish.....39. QUERCUS MACROCARPA.
Usually not over half-way to the midrib and more acute.
66. Q. BICOLOR.
*f*². Acutish and mucronulate .....216. QUERCUS MACDONALDII.
*f*³. Bristle-pointed; sinuses
g. Moderately deep and narrow;
Lobes narrowing towards apex and mostly terminating in 1–3 bristle-pointed teeth ..... 15. Q. RUBRA.
Lobes generally widening towards apex and terminating in 3–7 bristle-pointed teeth.....162. Q. CALIFORNICA.
*g*². Deeper and broader; lobes narrower.....93. Q. TINCTORIA.
*g*³. Deep, broad and rounded; lobes very narrow; acorn
Ovoid-oblong, ½ immersed in a coarse-scaled cup.
69. QUERCUS COCCINEA.
Flattened-globular, ¼ immersed in a fine-scaled cup.
94. QUERCUS PALUSTRIS.
*e*⁴. Broad, truncate at both base and apex, and with two spreading lobes on each side.....2. LIRIODENDRON TULIPIFERA.
*e*⁵. Wavy and spinous-toothed, very thick.....52. ILEX OPACA.
*e*⁶. Undulately crenate-toothed; obovate-oblong,
Slightly if at all pubescent beneath .....67. QUERCUS PRINUS.
Velvety pubescent beneath... .....116. QUERCUS MICHAUXII.
*e*⁷. Sinuate-toothed, white-tomentose beneath.....96. POPULUS ALBA,
*e*⁸. Cut-serrate or sublobate, with slender petioles;
Ovate, coarsely cut-serrate.....83. PYRUS CORONARIA.
Round-ovate, finely cut-serrate .....86. CRATÆGUS COCCINEA.
*e*⁹. Crenate-serrate; petioles 1 in. or slightly less in length.
82. PRUNUS CERASUS.
*e*¹⁰. Obscurely crenulate-toothed: leaves
f. Alternate, petioles long, mostly 1½ in. or more.
87. CORNUS ALTERNIFOLIA.
*f*². Opposite, petioles short (less than 1 in.); involucral scales when fully developed.
Obcordate ..... 88. CORNUS FLORIDA.
Pointed at apex.....185. CORNUS NUTTALII.
*e*¹¹. Undulate-serrate, ⅛–¼ in. long and bearing large scattered glands.
154. DALEA SPINOSA.
*e*¹². Doubly serrate,
Rhombic-ovate .....81. PRUNUS NIGRA.
Ovate-oblong .....210. CRATÆGUS DOUGLASII.
*e*¹³. Crenately lobed; lobes glandular dentate.. .....217. ALNUS OREGONA.
*d*². Main ribs several, palmately-veined, etc.; rib
e. single at first but soon sending off a strong vein on each side and leaves 3-lobed, 2-lobed and entire on same tree.... 32. SASSAFRAS OFFICINALE.
*e*². Ribs three at first, but soon five or more by branching, leaves alternate, base of petiole concave and fitting over the axillary bud, obscurely 3–5-lobed with broad shallow sinuses.....13. PLATANUS OCCIDENTALIS.
5-lobed with narrow and deeper sinuses....135. PLATANUS RACEMOSA.
*e*³. 5–7 from commencement; leaves
*e*⁴. 7–9-ribbed and lobed, suborbicular.....203. ACER CIRCINATUM.
f. Opposite, base of petiole subtending (not covering) the axillary bud.

Doubly and sharply serrate, nutlet inclosed in a papery sac.
41. OSTRYA VIRGINICA.
Unequally and sharply serrate, nutlet subtended by a leafy bract.
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*e*². Ribs three at first, but soon five or more by branching, leaves alternate, base of petiole concave and fitting over the axillary bud, obscurely 3–5-lobed with broad shallow sinuses.....13. PLATANUS OCCIDENTALIS.
5-lobed with narrow and deeper sinuses....135. PLATANUS RACEMOSA.
*e*³. 5–7 from commencement; leaves
*e*⁴. 7–9-ribbed and lobed, suborbicular.....203. ACER CIRCINATUM.
f. Opposite, base of petiole subtending (not covering) the axillary bud.

f. Elevated and persistent
g. 4-sided; branchlets
Pubescent .....20. PICEA NIGRA.
Glabrous.. .. ..100. PICEA ALBA.
*g*². Flat; branchlets smooth; cones cylindrical .....149. PICEA SITCHENSIS.
*f*². Not elevated nor persistent; leaves short thick and crowded.
174. ABIES MAGNIFICA.
*e*². Ridged below, grooved above, nearly equally 4-sided.
225. ABIES NOBILIS.
*e*². Terete..... .....196. PINUS MONOPHYLLA.
c. Linear, flat and
d. Conspicuously 2-ranked — diverging in two directions,
e. Petioled and margin
f. Obscurely denticulate, obtuse at apex and with persistent bases of petioles (TSUGA)
Slightly grooved above, cones pedicilate .... 21. T. CANADENSIS.
Conspicuously grooved, cones sessile... .....223. T. HETEROPHYLLA.
*f*². Entire, revolute, acute at apex .....144. TAXUS BREVIFOLIA.
*e*². Subsessile rigid and sharply bristle-pointed, about 1 inch long and generally tapering from wide base.....120. TORREYA TAXIFOLIA.
1–3 inches long, of more nearly uniform width.
145. TORREYA CALIFORNICA.
*e*³. Sessile, entire, keeled below those of the sterile branches
f. Narrow-linear
$\frac{3}{4}$ in. long, obtusely pointed.....22. ABIES BALSAMEA.
$\frac{1}{2}$ in. long, conspicuously emarginate .....224. ABIES GRANDIS.
$\frac{2}{3}$ in. long, obtuse or acute at apex, rounded above
173. ABIES CONCOLOR.
*f*². Wide-linear, pungent at apex, $\frac{3}{4}$ in. long or less
143. SEQUOIA SEMPERVIRENS.
*d*². Somewhat 2-ranked, short-petiolate
e. Articulated on a permanent-base and keeled above
171. TSUGA PATTONIANA.
*e*². Breaking away entire and leaving permanent leaf-scars
$\frac{3}{4}$ to 1 in. long; winter buds $\frac{1}{8}$–$\frac{1}{4}$ in.
150. PSEUDOTSUGA TAXIFOLIA.
$\frac{3}{4}$ to 1$\frac{1}{4}$ in. long; winter buds $\frac{1}{4}$–$\frac{1}{2}$ in.
PSEUDOTSUGA MACROCARPA.
*c*². Scale-like or awl-shaped, imbricated and closely appressed
d. In 4 ranks and making a conspicuously
e. Flat two-edged branchlet; cones with leathery scales and
4 scales usually fertile.....24. THUJA OCCIDENTALIS.
6 scales usually fertile..... .. 220. THUJA GIGANTEA.
*e*². Flattish but narrower branchlet.....141. LIBOCEDRUS DECURRENS.
*e*³. 4-angled rather than flat branchlet; cones subglobose, with peltate valvate scales
f. Maturing the first season, $\frac{1}{3}$ in. in diameter; leaves entire
74. CHAMÆCYPARIS THYOIDES.
*f*². Maturing the second season; leaves denticulate and
g. Obscurely glandular; cones
$\frac{1}{2}$-1 in. long ..... 166. CUPRESSUS GOVENIANA.
1-1$\frac{1}{2}$ in. long..... ....195. CUPRESSUS MACROCARPA.
*g*². Conspicuously glandular-pitted, glaucous
219. CUPRESSUS MACNABIANA.
d. Terenate leaves
Roundish at apex..... 166. JUNIPERUS CALIFORNICA.
More acute at apex.....168. JUNIPERUS OCCIDENTALIS.
*d.*³ Scattered, or spirally arranged, mostly carniate...142. SEQUOIA GIGANTEA.
*c*⁴. Laminate and
d. Elliptical to ovate, about 1 in. long, coriaceous..201. CEANOTHUS SPINOSUS.
*d*². Ovate to oblong
e. Single-ribbed
f. 1–5 in. long, at base
g. Rounded, truncate or slightly heart-shaped,

h. Pale or glaucous beneath, darker above.
i. 1–1½ in. long, spinose-dentate ..... 156. PRUNUS ILICIFOLIA.
*i*². 2–3 in. long, entire.....153. RHUS OVATA.
*i*³. 3–5 in. long, entire
Whitish beneath, flat.....132 ARBUTUS MENZIESII.
Greener beneath, curving lengthwise..... 180. RHUS LAURINA.
*i*⁴. 2–4 in. long, undulately spinose-toothed ... .52. ILEX OPACA.
*h*². Tomentose and concave beneath; margin
i. Entire and undulate... .....131. GARRYA ELLIPTICA.
*i*². Both entire and spinose-toothed leaves on the same tree.
j. Lateral veins strongly impressed above, parallel and continuous to the margins, which are serrate, or occasionally entire.
138. QUERCUS DENSIFLORA.
*j*². Not strongly impressed, and less parallel, pubescent at first beneath and finally
Glabrous, margin undulate, spinose-toothed
137. QUERCUS AGRIFOLIA.
Glaucous, sinuate spinose-dentate.....161. QUERCUS CHRYSOLEPIS.
*g*². Obtuse to acute, stiff, coriaceous, yellow-green beneath.
176. RHAMNUS INSULARIS.
*g*³. Cuneate at base, glabrous or nearly so beneath, slightly revolute, flat.
159. UMBELLULARIA CALIFORNICA.
*f*². 6–12 in. long, thick, entire, acute at both ends
101. MAGNOLIA GRANDIFLORA.
*f*³. 3–6 in. long, blade
g. Articulated to the petiole, which is
Conspicuously winged; stamens usually 20.
103. CITRUS AURANTIUM.
Slightly, if at all, winged; stamens usually 35.
104. CITRUS LIMONUM.
*g*². Not articulated to petiole which is
Scarcely 1 in. long ....158. RHODODENDRON CALIFORNICUM.
1½–3 in. long.. ....188. NICOTIANA GLAUCA.
*e*². Three-ribbed (*Ceanothus*), in length
⅜–1½ in., ovate, branchlets terete.....202. C. SOREDIATUS.
1–2 in., oblong, branchlets angular.....151. C. THYRSIFLORUS.
2–4 in., broad ovate.....177. C. ARBOREUS.
*d*². Obovate to oblong.
½ to 1½ in. long, serrate above and entire at base.
130. CERCOCARPUS PARVIFOLIUS.
1–3 in. long, blue-green..... .....215. QUERCUS ENGELMANNI.
2 to 5 in. long, with
Entire revolute margin.....117. QUERCUS VIRENS.
Glandular-serrate margin.....181, HETEROMELES ARBUTIFOLIA.
*d*³. Ovate-orbicular, thick and obtuse at apex.....179. RHUS INTEGRIFOLIA.
*d*⁴. Lanceolate, lateral veins
Parallel.....182. LYONOTHAMNUS FLORIBUNDUS.
Not parallel, 2–4 in. long.....186. OLEA EUROPEA.
*d*⁵. Lanceolate oblong.
e. 3–5 in. long, margin
f. Crenate-serrate .....102. GORDONIA LASIANTHUS.
*f*². Crenate-dentate (and entire) tomentose beneath.
191. QUERCUS TOMENTELLA.
*f*³. Sinuate-dentate (and entire) glabrous beneath, dark-green above.
192. QUERCUS WISLIZENI.
*f*⁴. Entire and leaves
g. Opposite, glabrous beneath.....112. OSMANTHUS AMERICANUS.
*g*². Alternate and beneath
Rusty-pubescent.....113. PERSEA PALUSTRIS.
Golden-scurfy beneath .....139. CASTANOPSIS CHRYSOPHYLLA.
*e*². 2 in. long, entire, glandular beneath..... ...108. CLIFTONIA LIGUSTRINA.
*d*⁶. Oblanceolate, serrate, with short stout petioles .164. MYRICA CALIFORNICA.
*d*⁷. Linear-lanceolate, with broad clasping base and sharp horny tip.
175. YUCCA ARBORESCENS.

d^8. Falcate and vertically disposed upon the branchlet.
$\frac{1}{4}$–$\frac{1}{3}$ in. broad.....211. EUCALYPTUS ROSTRATA.
$\frac{3}{4}$–1 in. broad.....183. EUCALYPTUS GLOBULUS.
d^9. Peltate and palmately 7-many-lobed.....189. RICINUS COMMUNIS.
d^{10}. Flabellate, large and filiferous.....200. WASHINGTONIA FILAMENTOSA.
b^2. Compound, drooping and with leaflets.
11–21, irregularly cut-lobed.....213. GREVILLEA ROBUSTA.
25–30, entire or remotely serrate.....178. SCHINUS MOLLE.
a^4. **Leaves Subpersistent** — evergreen southward, but more or less deciduous northward, or individual trees shedding their leaves while most of the trees do not.
Narrow obovate; 1–3 in. long.....107. CYRILLA RACEMIFLORA
Lanceolate to oval, 3–6 in. long, glaucous beneath..51. MAGNOLIA GLAUCA.
a^5. **Leaves wanting**; branches green, jointed and flattened..184. OPUNTIA TUNA.

A KEY BASED UPON THE FRUIT

Designed as an Aid in identifying the Species represented in Parts I-IX inclusive, when in Season for procuring the Fruit.

N. B. — The remarks concerning the use of the Key based upon the Leaves are equally true with reference to this.

a. **Free Fruit.** — formed by the ripening of a single pistil either simple or compound.
b. *Indehiscent pericarp.*
c. Samara — dry, usually 1-celled, 1-seeded and with 1-2 membranous wings.
d. In terminal panicles; wing somewhat oblong-lanceolate, with a lenticular seed at about its center, and beyond which the wing is twisted (*Ailanthus*) ..... 4. A. GLANDULOSUS.
d[2]. In terminal cymes, a 2-seeded suborbicular samara, winged all around. 77. PTELEA TRIFOLIATA.
d[3]. In umbellate corymbs, each pedicel supporting a pair of samaræ with oblanceolate wings, obtuse at the apex and with main rib on outer margin (*Acer*).
e. Fruit maturing in the fall, wings.
Slightly divergent ..... 7. A. SACCHARINUM, WANG.
Widely divergent ..... 203. A. CIRCUMATUM.
e.[2] Fruit maturing in early summer.
f. Large, 1¼ in. or more, downy when young..... 26. A. DASYCARPUM.
f[2]. Smaller, smooth, pendulous and
Red, in umbels..... 53. A. RUBRUM.
Greenish, in racemes, wings incurved..... 54. A. NEGUNDO.
d[4]. In terminal racemes, two samaræ on a single pedicel with main rib on outer margins; seed-bearing portion
Glabrous ..... 79. ACER PENNSYLVANICUM.
Densely hairy..... 152. ACER MACROPHYLLUM.
d[5]. In axillary racemes or panicles, winged at the apex with a more or less lanceolate obtuse wing (*Fraxinus*).
e. Terete at base (seed-bearing portion); branchlets and petioles
f. Smooth. ..... 10. F. AMERICANA.
f[2]. Velvety pubescent; lateral leaflets
Petiolulate and
3-7 in number..... 212 FRAXINUS VELUTINA.
7-9 in number..... 31. FRAXINUS PUBESCENS.
Sessile or nearly so..... 187. F. OREGONA.
e[2]. Flat — wing extending along the seed-bearing portion. 62. F. SAMBUCIFOLIA.
d[6]. In lateral fascicles or clusters, winged all around (*Ulmus*).
Sessile or nearly so, cell pubescent and margin not ciliate. 11. U. FULVA.
In fascicles, cell smooth, margin densely ciliate..... 33. U. AMERICANA.
In racemes, cell pubescent, margin ciliate..... 34. U. RACEMOSA.
c[2] Drupe or drupe-like and with a single seed.
d. Fibro-fleshy and dryish pericarp.
e. Small, ¼ in. or less, subglobose (*Rhus*), in terminal
f. Thyrses and clothed with crimson hairs..... 5. R. TYPHINA.

*f*². Panicled spikes and clothed with viscid gray hairs,
2–3 lines in length. 153. R. OVATA.
5 lines in length .....179. R. INTEGRIFOLIA.
*e*². Larger and with edible embryo (*Juglans*), in length
f. ¾–1¼ in., globose, with pubescent epicarp.....190. J. CALIFORNICA.
*f*². 2 in.,
Ovoid-oblong, covered with brownish viscid hairs.....14. J. CINEREA.
Globose, roughly dotted.....35. J. NIGRA.
*d*². Fleshy pericarp,
e. Ovoid and
f. Clustered on axillary peduncles,
g. On the growth of the season, 2 or 3 together, 2½ in. long, blue,
h. Sessile upon the peduncle; stone longitudinally striated.
9. NYSSA MULTIFLORA.
*h*². Pedicellate, stone not striated; fruit subtended by
Persistent calyx-tube and lobes, ½ in. or less in length
113. PERSEA PALUSTRIS.
Enlarged calyx-tube only, 1 in. or less in length.
159. UMBELLULARIA CALIFORNICA.
*g*². On growth of the previous season.....111. FORESTIERA ACUMINATA.
*f*². Racemed, bluish and with short, fleshy, red pedicels.
32. SASSAFRAS OFFICINALE.
*e*². Ovoid-oblong, 1–1½ in. long; petioles
Biglandular; pit compressed. .....81. PRUNUS NIGRA.
Eglandular; pit more turgid..... 207. PRUNUS SUBCORDATA.
*e*³. Oblong, tipped with the remnants of the style and about 1 in. in length.
Reddish and stone longitudinally striated with membranous-edged ridges.....110. NYSSA OGECHE.
Dark blue, stone not membranous-ridged; flesh
Thin and dryish.....112. OSMANTHUS AMERICANUS.
Thicker and very oily .....186. OLEA EUROPEA.
Black and borne in abundance on paniculate spadices.
200. WASHINGTONIA FILAMENTOSA.
*e*⁴. Subglobose and surface
f. Smooth
g. Purple or purplish black and
h. Solitary, of sweet flavor .....12. CELTIS OCCIDENTALIS.
*h*². In racemes and of a vinous or astringent flavor; racemes
4–6 in. long; drupes numerous and ¼ in. thick.
29. PRUNUS SEROTINA.
1–3 in. long; drupes few and larger.....156. PRUNUS ILICIFOLIA.
*h*³. In umbels, larger, of
Acid-vinous flavor, ½ in. in diameter.....82. PRUNUS CERASUS.
Sweet-vinous flavor, ¾ in. in diameter..... .56. PRUNUS AVIUM.
*g*². Light-red, very sour, in umbels .....55. PRUNUS PENNSYLVANICA.
*g*³. Dark-red, very bitter, in corymbs.....208. PRUNUS MOLLIS.
*g*⁴. Whitish
Not tipped with remnants of the style, rosy-cheeked
178. SCHINUS MOLLE.
Tipped with the stout styles..... 180. RHUS LAURINA.
*f*². Papillose and with waxy exudation.....164. MYRICA CALIFORNICA.
*c*³. Drupe-like but containing more than one seed, and seeds
d. Inclosed in a bony
e. 2–3-celled stone,
f. Blue, subglobose, in flat-cymes with red stems.
87. CORNUS ALTERNIFOLIA.
*f*². Bright-red, elongated, sessile, usually in a single head
Only 3 or 4 developing .....88. CORNUS FLORIDA.
30 or 40 developing .....185. CORNUS NUTTALLII.
*e*². 3–5-celled stone; yellowish-white, in loose axillary panicles.
105. MELIA AZEDARACH.
*d*². Distinct, (not inclosed in a common stone); fruit
e. Crowned with persistent

f. Calyx-teeth,
g. Purple-black, 5-seeded, in umbels .....8. ARALIA SPINOSA.
*g*¹. Red or purplish,
4–8-seeded, axillary.....52. ILEX OPACA.
2-seeded, in terminal panicles.....181. HETEROMELES ARBUTIFOLIA.
*f*¹. Style or remnants of it ; fruit about
⅛ in. long, dryish, in racemes .. ..107. CYRILLA RACEMIFLORA.
¼ in. long, juicy, in cymes.....157. SAMBUCUS GLAUCA.
*f*³. Not crowned with either calyx-teeth or style,
g. Sessile, scaly-bracted beneath ; leaves evergreen; fruit
Dark blue, seeds 1–4.....25. JUNIPERUS VIRGINIANA.
Blue-black, seeds 2–3 .....168. JUNIPERUS OCCIDENTALIS.
Reddish-brown, seeds 1–2. . ..... 167. JUNIPERUS CALIFORNICA.
*g*¹. Pedicellate, not scaly-bracted beneath, slightly 2-3-lobed, 2-3-seeded,
Black; nutlets indehiscent..... ...126. RHAMNUS PURSHIANA.
Red; nutlets dehiscent.....176. RHAMNUS INSULARIS.
*c*¹. Nut—hard, single coat and furnished with an involucral cup or covering.
d. Ovoid oblong or ellipsoidal, surrounded at its base with an involucral cup (*Quercus*), acorn borne
e. On the new wood of the season (*i. e.* maturation annual) cup
f. Less than ½ enveloping the oval acorn, which is
Obtusely pointed; foliage yellow-green..... 136. Q. GARRYANA.
Acutely pointed; foliage bluish-green.....214. Q. DOUGLASII.
*f*². About ½ enveloping the small
Ovoid nut ¾ in. long : scales thin.....68. Q. MUHLENBERGII.
Long, narrow nut, often 2 in. long.....160. Q. LOBATA.
*f*³. About ⅓ enveloping the nut
g. Thick, scales very roughly tubercled, edge of cup rather inturned after shedding the nut; foliage
h. Yellow-green, deciduous; nut long-ovoid ; leaves
5–9 in. long; lobes rounded.....38. Q. ALBA.
1½–3½ in. long, lobes pointed.....216. Q. MACDONALDI.
*h*¹. Blue-green, persistent; nut ovid.....215. Q. ENGELMANNI.
*g*². Thinner, scales thinnish ; leaves
Deciduous ; peduncles shorter than petioles....67. QUERCUS PRINUS.
Subpersistent ; acorns sessile or nearly so..137. QUERCUS AGRIFOLIA.
*f*⁴. Scarcely ½ enveloping the oblong-ovoid nut about 1½ in. in length.
116. QUERCUS MICHAUXII.
*f*⁵. About ½ or more enveloping the nut; peduncles longer than the petioles ; nut
¾ in. long, light brown.....66. QUERCUS BICOLOR.
⅓ in. or less long, dark brown.....117. QUERCUS VIRENS.
*f*⁶. About ½ or more enveloping the nut ; peduncles
g. Longer than the petioles..... .....66. Q. BICOLOR.
*g*¹. Shorter than the petioles ; scales
Very loosely appressed, forming a moss-like fringed margin of cup.
39. Q. MACROCARPA.
More closely appressed and not forming a moss-like fringe.
92. Q. OBTUSILOBA.
*e*². On wood of the preceding season (*i. e.* maturation biennial) ; cup
f. Very shallow, almost flat and with long-linear recurved scales.
138. QUERCUS DENSIFLORA.
*f*¹. Saucer-shaped,
g. One-fourth enveloping the nut which is
1 in. or less in length; saucer thin .....15. Q. RUBRA.
1½ in. long ; saucer thin at rim..... ....191. Q. TOMENTELLA.
2 in. or less in length; saucer usually thick.....161 Q. CHRYSOLEPIS.
*g*². One-half enveloping an ovoid nut..... .....162. Q. CALIFORNICA.
*g*³. Flattened-globose ; leaves
Sinuate-pinnatifid with wide sinuses..... 94. QUERCUS PALUSTRIS.
Obovate-spatulate, entire.....118. QUERCUS AQUATICA.
*f*². Top-shaped, ½ enveloping the acorn ; scales thin and coarse :
Inner bark of tree reddish..... .....69. Q. COCCINEA.
Inner bark yellowish..... .....93. Q. TINCTORIA.

*f*⁴. Turbinate, ½ enveloping the nut .....192. Q. WISLIZENI.
*d*². Club-shaped, short, surrounded with stiff hairs, tipped with the persistent recurved style and arranged in globular heads, which are
Solitary.....13. PLATANUS OCCIDENTALIS.
2–7 together in a moniliform spike .....135. PLATANUS RACEMOSA.
*d*³. Achenium-like, small and borne in short catkins,
Inclosed in a membranous inflated sac, catkin hop-like.
41. OSTRYA VIRGINICA.
Subtended by a large leafy bract..... ....42. CARPINUS CAROLINIANA.
*c*⁵. Nut-like, dry, not invested with an involucre,
Smoothish, globose, about ¼ in diameter, in cymes with leaf-like bract attached .... 3. TILIA AMERICANA.
Rough, with scale-like points, ovate, coriaceous.
114. PLANERA AQUATICA.
*c*⁶. Pod (legume) which is
d. Oblong, flat, about 2 in. broad and curved ..27. GYMNOCLADUS CANADENSIS.
*d*². Linear or nearly so
10–18 in. long, contorted and twisted....28. GLEDITSCHIA TRIACANTHOS.
4–6 in. long, subterete, compressed between the seeds and thick-valved.....129. PROSOPSIS JULIFLORA.
3–4 in. long, 2–8-seeded and thin valved..128. CERCIDIUM TORREYANUM.
*d*³. Obliquely ovate (1–2 in. long), long stalked and mostly 1-seeded.
109. GLEDITSCHIA MONOSPERMA.
*d*⁴. Ovate. compressed and with accrescent calyx.....154. DALEA SPINOSA.
*d*⁵. Closely twisted spiral. ....205. PROSOPIS ODORATA.
*c*⁷. Pome ; endocarp and testa
d. Cartilaginous ; fruit
e. Sunken at insertion of pedicel,
f. Globular
Large, 1 in. or more, distinctly 5-celled ....30. PYRUS MALUS.
Small, more or less 10-celled.....59. AMELANCHIER CANADENSIS.
*f*². Fattened-globose, waxy, fragrant and very tart..83. PYRUS CORONARIA.
*f*³. Oblong, ½–¾ in. long. .... 209. PYRUS RIVULARIS.
*e*². Not sunken at insertion of pedicel, pyriform .....57. PYRUS COMMUNIS.
*d*³. Not cartilaginous, 1-5 bony seeds : color
Black, subglobose, ½ in. in diameter..... ....210. CRATAEGUS DOUGLASII.
Dull red, thickness
⅝ in. (sometimes yellow) with white dots.....58. CRATAEGUS PUNCTATA.
½ in.; leaves thick, glossy above..... .. 85. CRATAEGUS CRUS GALLI.
Bright scarlet and somewhat oblong, ½ in. long ..86. CRATAEGUS COCCINEA.
*c*⁸. Berry.
d. With persistent thickish calyx-lobes, large (about 1 in. or more),
61. DIOSPYROS VIRGINIANA.
*d*². Without persistent calyx-lobes and smaller
e. In thyrses ....78. VITIS ÆSTIVALIS.
*e*². In compact-racemes and
Hoary-tomentose ..... 131. GARRYA ELLIPTICA.
Smooth and flattened-globose.....133. ARCTOSTAPHYLOS PUNGENS.
*e*³. In open panicles..... . ...132. ARBUTUS MENZIESII.
*e*⁴. Singly on the jointed flattened stem. ..... 184. OPUNTIA TUNA.
*c*⁹. Fleshy, with custard-like edible pulp .....76. ASIMINA TRILOBA.
*c*¹⁰. Berry-like pome, ⅜ in. in diameter and borne in dense clusters.
84. PYRUS SAMBUCIFOLIA.
*c*¹¹. Hesperidum — seeds in juicy pulp and rind leathery.
Subglobose, flattened at the ends .....103. CITRUS AURANTIUM.
Globose-oblong, mammillate at the extremity.....104. CITRUS LIMONUM.
*c*¹². Achenium.
3–4-angled and with membranous wing-like margins.
108. CLIFTONIA LIGUSTRINA.
Linear-oblong, tipped with the prolonged tail-like style.
130. CERCOCARPUS PARVIFOLIUS.
*c*¹³. Baccate but with dry spongy pericarp..... 175. YUCCA ARBORESCENS.
*b*². *Dehiscent pericarp,*
c. Subglobose, and

d. Coriaceous or woody, dehiscent by
e. 2-3 valves and containing one or very few large seeds with smooth shining coat and a large scar (*Æsculus*), fruit
Prickly and leaflets 7 ..... 6 ÆSCULUS HIPPOCASTANUM.
Smooth and leaflets 5 ..... 127. ÆSCULUS CALIFORNICA.
*e*². 4 more or less distinct valves (*Carya*).
f. Epicarp thick and separating quite freely to the base; nut ridged, with thick shell, globular-ovoid and
g. Flattened,
1 in. or less in length..... 36. CARYA ALBA.
1¼ in. or more in length..... 64. CARYA SULCATA.
*g*². Not so much flattened, usually 4-angled... ....90. CARYA TOMENTOSA.
*f*². Epicarp only moderately thick and nut of medium size, moderately ridged and with shell of medium thickness.....65. CARYA PORCINA.
*f*³. Epicarp thin, nuts small and thin-shelled; kernel
g. Astringent and bitter; sutures of epicarp very prominent; nut
Quite smooth, whitish and only slighly compressed. 37. CARYA AMARA.
Rough, reddish, strongly compressed and angled. 115. CARYA AQUATICA.
*g*². Slightly if at all bitter, nut whitish and sutures moderately prominent. 91. CARYA MICROCARPA.
*e*³. 5–20 valves recurving from central axis and liberating numerous fine seeds ....158. RHODODENDRON CALIFORNICUM.
*d*². Covered with spines; dehiscent
e. By four valves; nuts
Sharply 3-angled, 2 together, involucre soft-prickly. 16. FAGUS FERRUGINEA.
Subovoid, flattened, 1–3 together, involucral spines very sharp and hard.. .....40. CASTANEA VESCA.
*e*². Irregularly; spines many-branched; nut maturing the second year. 139. CASTANOPSIS CHRYSOPHYLLA.
*e*³. Into three cocci, each liberating a single seed ....189. RICINUS COMMUNIS.
*c*². Small, ovoid-lanceolate capsules arranged in catkins, opening by two valves and containing numerous seeds furnished with silky down; capsule
d. Oblong-conical, small and thin-walled; leaves
e. Orbicular-ovate and
f. Coarsely dentate..... .....18. POPULUS GRANDIDENTATA.
*f*². Serrate, short-pointed .....72. POPULUS TREMULOIDES.
Sinuate, wooly tomentose beneath ..... 96. POPULUS ALBA.
Linear lanceolate, tomentose on midrib above and petiole. 45. SALIX NIGRA.
*e*². Ovoid-oblong, larger and thicker walled; leaves
f. Broad-ovate, obscurely crenate-serrate obtuse or rounded at apex. 97. POPULUS HETEROPHYLLA.
*f*². Ovate or ovate-lanceolate, acuminate, whitish and reticulate-veined beneath ..... 47. P. BALSAMIFERA.
*f*³. Deltoid-ovate coarsely crenate-serrate usually.
Abruptly acuminate .. .. 48. POPULUS MONILIFERA.
Shorter-pointed or acute ..... 194. POPULUS FREMONTII.
*f*⁴. Broadly deltoid... ..... 63. POPULUS DILATATA.
*d*². Larger, subglobose and pubescent..... 218. POPULUS TRICHOCARPA.
*d*⁶. Lanceolate or elliptic-lanceolate,
e. Smooth and capsules
f. Sessile or nearly so.....46. SALIX ALBA var. VITELLINA.
*f*². With slender pedicels; leaves pale glaucous beneath and
2–4 in. long..... ..... 71. SALIX AMYGDALOIDES.
3–7 in. long.. .. ..140. SALIX LAEVIGATA.
*e*². Pubescent; capsules about
⅛ in. long, ovate-lanceolate..... .....193. SALIX NUTTALLII.
¼ in. long, oblong-ovoid. .....165. SALIX LASIOLEPSIS.
*c*³. Linear compressed pods opening by two valves; pods
4–5 in. long, ¼ in. broad, quite straight.....80. ROBINIA PSEUDACACIA.
3–5 in. long, variously twisted..... .. .206 ACACIA DECURRENS.

2 in. long, ⅛ in. broad, often curved into a circle.
155. ACACIA MELANOXYLON.
*c*⁴. Torulose, straight or curved, 2–3 in. long, 1–3-seeded.
204. PARKINSONIA MICROPHYLLA.
*c*⁵. Subcylindrical pods, long. opening by two valves.
6–10 in. long, ¼ in. or less thick.....134. CHILOPSIS SALIGNA.
10–12 in. or more long, ½ in. or more thick....89. CATALPA BIGNONIOIDES.
*c*⁶. Very oblique and containing two winged seeds...213. GREVILLEA ROBUSTA.
*c*⁷. Ovoid 5-valved capsule.....102. GORDONIA LASIANTHUS.
*c*⁸. Subovoid follicles arranged
In pairs, seed not suspended by a funiculus.
182. LYONOTHAMNUS FLORIBUNDUS.
Not in pairs; seed suspended by a funiculus.
106. XANTHOXYLUM CLAVA-HERCULIS.
*c*⁹. Three-lobed capsules dividing into three dehiscent cocci; (*Ceanothus*) leaves
d. 3-ribbed and length
½–1½ in., ovate; branchlets terete ..... 202. C. SOREDIATUS.
1–2 in., oblong; branchlets angular.....151. C. THYRSIFLORUS.
*d*². Single-ribbed,
1 in. long, branchlets terete coriaceous. . ...201. C. SPINOSUS.
2–4 in. long, branchlets slightly angled.. .. ..177. C. ARBOREUS.
*c*¹⁰. Top-shaped capsule, ⅜ in. in diam., cells dehiscent at summits.
183. EUCALYPTUS GLOBULUS.
*c*¹¹. Hemispheric capsule, ¼ in. in diam. cells dehiscent at summits.
211. EUCALYPTUS ROSTRATA.
*c*¹². Oblong-ovoid 2-valved capsule closely invested by persistent calyx.
188. NICOTIANA GLAUCA.
*a*². **Aggregated Fruit** — composed of many carpels, either closed or opened and cohering or closely massed together, forming a
b. Cone.
c. Scales of the cone open carpels (*Coniferæ*).
d. Scales many and spreading at maturity.
e. Imbricated and each subtended by a bract; ovules 2, inverted, and
f. Maturing the year after flowering (*Pinus*); cones
g. Subterminal and scales
h. Thin at tip and unarmed; cones subcylindric and
4–6 in. long..... .....49. P. STROBUS.
5–11 in. long..... .....221 P. MONTICOLA.
12–18 in. long.....146. P. LAMBERTIANA.
*h*². Thickened at tip and
i. Armed with a recurved prickle.
j. 1–3 in. long, cylindric ovoid, oblique.....148. P. CONTORTA.
*j*². 3–6 in. long, glossy-brown,
k. Elongated conical, separating from the tree by a fracture
Within the peduncle.....125. P. CUBENSIS.
Within the base of cone.....147. P. PONDEROSA.
*k*². Broad-ovoid..... .....197. P. TORREYANA.
*j*³. 6–10. in. long..... 124. P. PALUSTRIS.
*i*². Unarmed cones about 2 in. in length, seeds
Winged, about ⅛ in. long.....19. P. RESINOSA.
Wingless, about ¾ in. long .....196. P. MONOPHYLLA,
*g*². Lateral and scales thickened at tip, cones
h. Slightly or not at all oblique
i. Ovoid-oblong; leaves 3–5 in. long; scales armed with a weak prickle directed
At about right angles from the axis of the closed cone.
75. P. MITIS.
Forward, at about 45° or less from the axis. .. ....123. P. GLABRA.
*i*². Ovoid-pyramidal.
j. Prickles strong; cones 2 in. or
Rather less in length; leaves 1½–3 in. long; branchlets purple.
89. P. INOPS.
Rather more; leaves 3–5 in. long.....50. P. RIGIDA.

*j*². Prickles weak; cones 2–3 in. long, and
Wide-pyramidal; leaves in 3's .....121. P. SEROTINA.
Narrow-pyramidal; leaves in 2's.....122. P. CLAUSA.
*h*². Markedly oblique
2-in. or less in length, scales unarmed.....99. P. BANKSIANA.
2-3½ in. long, scales armed with strong prickles..170. P. MURICATA.
3-5 in. long, outer scales very gibbous; oblique.
Ovoid, prickles minute and weak.....199. P. RADIATA.
Cyllindrical ovoid, prickles stouter.....222 P. ATTENUATA
4-8 in. long: scales very strongly armed. . . . .198. P. SABINIANA.
10–15 in. long, armed with very large, strong prickles.
169. P. COULTERI.
f. Maturing the first season — the autumn after blossoming.
g. Ovoid or oblong, ¼ in. long, pendent; bracts inconspicuous; scales persistent on the axis, thin and with eroded tip.....20. PICEA NIGRA.
*g*². Ovoid, pendent; scales thin and entire at tip.
Pedunculate, ⅝–¾ in. long; cone scales orbicular oblong bracts truncate.....21. TSUGA CANADENSIS.
Sessile, ¾–1 in. long; cone-scales oblong; bracts cuspidate.
223 TSUGA HETEROPHYLLA.
*g*². Ovoid, small (8 lines or less), pendent, scales rounded and entire at tip.
21. TSUGA CANADENSIS.
*g*³. Subcylindrical
h. Erect; scales deciduous from the persistent axis (*Abies*); bracts
i. Shorter than cone-scales; leaves with resin ducts
j. Within the parenchyma
Cones 2½–4 in. long, purple .....22. A. BALSAMEA.
*j*². Close to epidermis of lower side; cones
k. 2–5 in. long; leaves
Dark-green above, flat, flexible and conspicuously emarginate.
224. A. GRANDIS.
Blue-green above, flat, rounded or acuminate at apex.
173. A. CONCOLOR.
*k*². 6–9 in. long; leaves blue-green, 4-sided..... 174. A. MAGNIFICA.
*i*². Longer than the cone scales reflexed and nearly covering them; cones 6–8 in. long; leaves grooved.....225. ABIES NOBILIS.
*h*². Nodding, small (about 2 in. long), scales persisting on the axis and entire at tip.....100. PICEA ALBA.
*h*³. Pendent, 1½–3 in. long, scales incisely denticulate.
149. PICEA SITCHENSIS
*g*⁴. Cylindrical oblong; bracts much exserted (*Pseudotsuga*); cones
2–3 in. long.....150 P. TAXIFOLIA.
5–8 in. long.....172. P. MACROCARPA.
*g*⁵. Ovoid or roundish, small, 9 lines or less in length, scales persistent on the axis at maturity .....23. LARIX AMERICANA.
*e*². Valvate, bractless, wedge-shaped, spreading, each with 3–7 inverted ovules; cone woody, oval and
2–3 in. long, scales usually 25–30 .....142. SEQUOIA GIGANTEA.
1 in. or less, scales short, 20 .....143. SEQUOIA SEMPERVIRENS.
*d*². Scales few, persistent, bractless; cone
e. Oblong and erect, with scales more or less thickened at tip,
f. Loosely imbricated, 8–12, thinnish.
Four scales only fertile.....24. THUJA OCCIDENTALIS.
Six fertile.....220. THUJA GIGANTEA.
f. Valvate, 4–6, thick, only two scales fertile.
141. LIBOCEDRUS DECURRENS.
*e*². Globose or subglobose, maturing the
f. First season, ⅛ in. in length ..... 74. CHAMÆCYPARIS THYOIDES.
f.² Second season and
½ in. in length; leaves conspicuously glandular.
219. CUPRESSUS MACNABIANA.
¾ in.; leaves obscurely glandular..... 166. CUPRESSUS GOVENIANA.
1–1½ in. leaves obscurely glandular..... 195. CUPRESSUS MACROCARPA.

*d*³. Scales several, breaking apart at maturity; cones subglobose.
119. TAXODIUM DISTICHUM.

*c*². Scales.

d. Thin, 3-lobed and deciduous, subtending very small samaræ (*Betula*).

e. Cones erect,

Sessile, ovoid-oblong, 1 in. in length.....17. B. LUTEA.

With downy peduncle, ovoid, smaller .....95. B. NIGRA.

*e*². Cones suberect, ovoid-oblong; scales thicker and with short divergent lobes; wing of nutlet not broader than the body..... 44. B. LENTA.

*e*³. Cones pendent, cylindrical and about

1 in. in length .....70. B. POPULIFOLIA.

1⅛ in. in length.....43. B. PAPYRACEA.

*d*². Thick, woody and persistent, ovoid-oblong

⅓–½ in. long; leaves pale-puberulous beneath.. 163. ALNUS RHOMBIFOLIA.

½–1 in. long; leaves rusty pubescent beneath. 217. .. ALNUS OREGONA.

*c*³. Scales closed carpels, growing from an elongated receptacle and consolidated.

d. Dehiscent at maturity along the medium line of the back, and letting out each 1–2 berry-like seeds suspended by extensile threads (*Magnolia*); cone

Cylindrical, curved, 2–3 in. long.....1. MAGNOLIA ACUMINATA.

Oblong, 1–1½ in. long.....51. MAGNOLIA GLAUCA.

Oval, 3–4 in. long.....101. MAGNOLIA GRANDIFLORA.

*d*². Indehiscent at maturity and falling away as samaræ.
2. LIRIODENDRON TULIPIFERA.

*b*³. Spherical head, hardened and bristling with 2-beaked capsules.
60. LIQUIDAMBAR STYRACIFLUA.

*b*³. Sorosis—a spike with bracts and calyx-lobes all thickened and sacculent.
63. MORUS RUBRA.

*a*³. **A Naked Seed,** subtended or surrounded by a fleshy disk.

b. Drupe-like, with fleshy covering, sessile, scaly-bracted beneath and about 1 in. in length, oval.....120. TORREYA TAXIFOLIA.

1½ in. length, obovoid .. .. 145. TORREYA CALIFORNICA.

*b*³. Bony seed, subtended by a fleshy cup.....144. TAXUS BREVIFOLIA.

A SYSTEMATIC STUDY

OF THE

Species whose Woods are Represented in the Accompanying Sections.

The timbers comprised in the series which this text is designed to accompany belong to what are known, botanically speaking, as *Flowering* and mostly *Exogenous Plants.* At the outset, therefore, we will, once for all, define these groups; and, as the characters herein given are equally true of all the species enumerated in the following pages, they need not be repeated in the further definition of the various sub-groups and species.

FLOWERING or PHÆNOGAMOUS PLANTS.

Plants producing flowers which consist essentially of stamens and pistils, the latter bearing ovules or seeds.

In distinction from the *Flowering Plants* are the *Flowerless* or *Cryptogamous Plants*, comprising the rest of the vegetable kingdom, from the very simply organized Slime Moulds and Bacteria up to the highly organized Ferns and Club-Mosses. But in the study of timbers this group is unimportant, as only in a few rare cases do any of its representatives attain the dimensions of trees. Those exceptions are the Tree-Ferns of tropical countries — gigantic ferns, which sometimes attain the height of fifty or sixty feet, with straight shafts quite like tree trunks and tops consisting of a bunch of enormous plume-like frouds. They, however, are of practically no value as timber..

EXOGENOUS or DICOTYLEDONOUS PLANTS.

Flowering plants whose stems consist of a central column of pith surrounded by wood in concentric layers, and this in turn by bark; the stems increasing in thickness by the addition of a new layer each year to the wood externally and to the bark internally. Leaves mostly netted-vein. First leaves of the embryo (cotyledons) two and opposite, or (in the Coniferæ) several in a whorl. Parts of the flower in fours or fives, very rarely in threes.

A second class of *Flowering Plants* and comprising the rest of the group is the *Endogenous* or *Monocotyledonous Plants*, characterized by having stems in which the wood occurs as threads or bundles running through a cellular, pith-like tissue so that a transverse section exhibits the wood as dots and not in concentric rings. Leaves mostly parallel-veined. Embryo with single cotyledon, or rarely two, and then alternate and unequal. Parts of the flower generally in threes. In southern United States and elsewhere in or near the tropics trees are found, such as the Palms, etc., which belong to this class.

Exogenous plants are subdivided into two well-marked groups or sub-classes — *Angiospermæ* and *Gymnospermæ*. The former includes by far the greater part of the Flowering Plants, and most of the species represented in "American Woods" are representatives of it.

ANGIOSPERMÆ.

Flowering, exogenous plants in which there is a complete pistil — with stigma and closed ovary — containing ovules which develop into seeds at maturity. This sub-class comprises many groups of plants known as *Orders*, and such as are represented by plants which attain the dimensions of trees, within the limits of the United States, we propose to consider in the following pages:

ORDER **RHAMNACEÆ**: BUCKTHORN FAMILY.

Leaves simple, mostly alternate and with stipules small or wanting. *Flowers* small, often polygamous and sometimes dioecious; sepals valvate in aestivation, small, distinct, concave and involute in the bud or wanting; stamens as many as the petals and opposite them, inserted with them in the edge of a perigynous disk lining the calyx-tube, short and sometimes connected with the lower part of the ovary; pistil solitary, with mostly superior ovary, 2-5 celled, each cell with a single erect anatropous ovule; stigmas 2-5. *Fruit* a drupe or pod with one seed in each cell and not arilled; embryo large with broad cotyledons and sparing fleshy albumen.

Order represented by small trees and shrubs of warm and temperate countries, with slightly bitter juice and often nauseous or purgative fruits.

GENUS CEANOTHUS, LINNAEUS.

Leaves mostly alternate, petioled, coriaceous or somewhat so, glabrous or variously pubescent, deciduous or persistent, with slender stipules falling away early. *Flowers* perfect, in showy terminal or axillary thyrsoid or cymose clusters, blue or white and with colored pedicels; calyx colored, 5-lobed, cohering with the ovary below, the triangular lobes incurved and deciduous; petals much exserted, hooded, spreading, with long slender claws; stamens 5, opposite the petals and inserted with them, spreading and often persistent, with long filaments and introrse 2-celled anthers longitudinally dehiscent; pistil with three short styles united below and single 3-celled and usually 3 lobed ovary surrounded with a fleshy persistent disk and containing a single erect orthotropous ovule in each cell. *Fruit* subglobose, 3-lobed, drupe-like at first, with persistent calyx-tube adnate at base, finally becoming dry and separating into three 2-valved dehiscent cocci each liberating a single obovate-lenticular seed with thin crustaceous testa, ventral raphe and fleshy albumen.

The genus is composed of about thirty species, mainly of shrubs, and is confined to North America, the greater number being found in California where some natural hybrids seem to occur. The name is of classical Greek origin and of rather obscure application.

201. CEANOTHUS SPINOSUS, NUTT.

REDWOOD MYRTLE, SPINY MYRTLE.

Ger., *Dornige Myrte;* Fr., *Myrte espineuse;* Sp., *Myrto espinosa.*

SPECIFIC CHARACTERS: — *Leaves* alternate, elliptical to ovate, ¾ to 1¼ in. long, pinnately veined, entire, rounded or emarginate at apex, somewhat cuneate at base, glabrous, coriaceous, with slender petioles 2 to 4 lines in length, drying to a brownish above and a clear green beneath; branchlets glabrous and somewhat spiny. *Flowers* blue, fragrant, in large thyrses sometimes 6 in. in length, the lower peduncles of which are sometimes 1 to 3 inches long, springing from the axles of leaves. *Fruit* capsules about 3 lines in diameter, depressed, scarcely lobed, resin-coated, crestless.

(The specific name, *spinosus*, Latin for *spiny*, refers to the fact that many of the branchlets terminate in leafless spur-like points.)

A small tree occasionally 30 ft. (9 m.) in height, with rather broad open head, divaricate branches and trunk occasionally 12 in. (0.30) in diameter. This is vested in a cinnamon-brown bark which is about ¼ in. thick and finally checked into firm irregular low ridges. It is often only a shrub but in favorable situations assumes the stature and habit of a tree.

HABITAT. — Among the California coast mountains from Los Angeles to Point Conception, attaining its largest dimensions near the mouths of cañons which open along the coast.

PHYSICAL PROPERTIES. — Wood heavy, hard, strong, of close grain and of a light red or salmon color; the narrow sap-wood lighter. The specific gravity, etc., have not been determined.

USES. — Little use is made of this wood owing to its scarcity in size large enough to be of service, though its properties would suggest its value in turnery, for tool handles, etc.

The glossy evergreen foliage of the tree and its ample, beautiful clusters of bright blue flowers give it an ornamental value well worthy of consideration.

MEDICINAL PROPERTIES we believe have never been ascribed to this species.

202. CEANOTHUS SOREDIATUS, H. & A.

DARK-LEAVED MYRTLE, SOUTHERN BLUE BLOSSOM, GREEN THORN.

Ger., *Süder Flieder;* Fr., *Lilas meridional;* Sp., *Lilac meridional.*

SPECIFIC CHARACTERS: — *Leaves* alternate, ovate to elliptic-lanceolate, ½ to 1½ in. long, with three primary veins, rounded or acute at base, acute or obtuse at apex, with finely glandular-serrate margin, dull glabrous above at maturity, grayish and with minute appressed silky hairs beneath; petioles short and finely pubescent; branchlets, at first puberulous and olive-colored, become finally purplish and finely red-warty, rigid. *Flowers* deep blue, in small simple pubescent

racemes, ½ to 2 in. long. *Fruit* capsules 2 lines in diameter, smooth or somewhat wrinkled and neither crested nor deeply lobed.

(The specific name is from the Greek σωρὸς, *a heap*, alluding to the minute roughness of the branchlets.)

This Ceanothus is generally considered a densely branched shrub, as it really is over a large part of its range, but I have seen it in Monterey County assuming the habit and stature of a tree 20 or 25 ft. (7 m.) in height, with symmetrical, rounded, twiggy top, and trunk, 10 or 12 inches (0.30 m.) in diameter, vested in quite smooth grayish-brown bark, which finally becomes fissured into low firm ridges.

HABITAT. — The coast region of California from Mendocino Co. to San Diego and seemingly attaining its greatest dimensions in cañons in the vicinity of Paso Robles.

PHYSICAL PROPERTIES. — Wood heavy, hard, strong, of very fine structure with inconspicuous medullary rays, and susceptible of a beautiful polish. It is of a rich brown color with lighter sap-wood and is often marked with small dots and streaks of parenchymatous tissue. Specific gravity, etc., have not been determined.

USES. — This is too uncommon a wood to be applied to any particular use, though its close, fine structure would suggest its appropriateness for use in turnery.

The tree is of ornamental value, in which respect it deserves more general recognition than it has heretofore received.

ORDER SAPINDACEÆ: SOAPBERRY FAMILY.

Leaves simple or compound. *Flowers* polypetalous, often irregular and mostly symmetrical; sepals and petals each 4-5, imbricated in the bud, the petals inserted with the 5-10 stamens on a perigynous or hypogynous disk: ovary 2-3-celled and lobed, usually 1-2 ovules in each cell; embryo mostly convoluted: no albumen. *Fruit* a membraneous, inflated pod, a leathery thick subspherical pod with nut-like seeds, or a winged samara.

GENUS ACER, TOURNEFORT.

Leaves opposite, simple, palmately-veined, 5 or occasionally 3-lobed; stipules none. *Flowers* small, in axillary racemes or corymbs, regular, polygamo-dicœcious, usually unsymmetrical; pedicels not jointed; sepals 5 (or 4–9), more or less united, colored; petals sometimes wanting, but, when present, 5 (or 4–9), equal and furnished with short claws; stamens commonly 8; ovary 2-lobed, formed of 2 united carpels, each bearing 2 ovules, only one of which commonly attains maturity; styles 2, long and slender, united only below and stigmatic down the inside. *Fruit* a double samara, finally separating when mature and ready to fall, the wings strengthened by a rib along one margin; cotyledons long and thin.

(The generic name, *Acer*, is the ancient Latin name of the Maple.)

203. ACER CIRCINATUM, PURSH.

VINE MAPLE.

Ger., *Rebenahorn;* Fr., *Erable de vigne;* Sp., *Arce de vid.*

SPECIFIC CHARACTERS:—*Leaves* nearly circular in outline, 2 to 7 in. across, palmately lobed, sometimes nearly to the middle, with 7 to 9 acute irregularly doubly-serrate lobes, cordate at base with broad shallow sinuses, thin, puberulous at first but glabrous at maturity with the exception of a tuft of pale hairs at the base above, dark green above, paler beneath and in autumn changing to orange and scarlet tints; petioles 1 to 2 in. long, stout, enlarged and clasping at base; winter buds about $\frac{1}{8}$ in. long and subtended by a stout scale with conspicuously ciliate margin; branchlets glabrous and somewhat glaucous, pale green or reddish. *Flowers* appear when leaves are about half grown, in loose drooping 10 to 12-flowered corymbs terminating slender 2-leaved branchlets, the staminate and pistillate together; sepals red or purple, villous, 2 to 3 lines long; petals much shorter, greenish white, broadly cordate at base and involuted at apex; stamens 6 to 8 with slender filaments villous at base and much longer than the petals in the sterile flowers, but shorter in the fertile flowers; pistil with glabrous ovary bearing two wide spreading lobes, bifed style and long exserted stigmas. *Fruit* ripens in late autumn, the samaras glabrous, each about 1 in. or a trifle more in length, reddish in color and spreading at about right angles to the pedicel; seed ovate, pale brown.

(The specific name, *cercinatum*, is a Latin word meaning *made round* and referring to the circular outline of the leaves.)

The Vine Maple occasionally attains the height of 30 or 40 feet (10 m.), but being generally more or less procumbent and vine-like its real length is often greater. Its trunk is occasionally 12 or 14 inches (0. 30 m.) in thickness and covered with a thin smoothish gray-brown bark, somewhat striated lengthwise and fissured with shallow grooves and finally exfoliating in thinnish brittle scales.

In this curious tree we see a habit of growth which is quite unique in our American forests. While not strictly vine-like, it seems to have to recline more or less upon surrounding objects, its trunk being perhaps for several feet prostrate on the ground, and then rising up to sprawl its branches across the wreck of an old cedar stub or other support, and elevate its branchlets with handsome leaves and showy-winged fruit to such light as the taller surrounding forest may permit it to have. Its entire trunk and branches to the final leaf-bearing twigs, may be loaded with the luxurious moss and lichens which burden everything in the damp forests of the regions in which it thrives. Often it sends up several stems from the same base, and in alluvial bottom-lands forms exclusive and almost impenetrable thickets, acres in extent, the branches taking root wherever they touch the ground and the dense shade prohibiting the growth of all other plants beneath.

HABITAT. — The coast region of British Columbia and southward through Washington, Oregon and to Mendocino Co., California,

being very abundant and well developed in western Washington and Oregon. It is less common to the southward and often no more than a shrub. It flourishes in the low-lands and to an altitude of about 4,000 ft., beautifying the banks of streams and adorning the stately evergreen forests in which it makes its home.

PHYSICAL PROPERTIES. — The wood of the Vine Maple is heavy, hard, not very strong, close-grained and containing very fine medullary rays. It is of a light-brown color with abundant light buff sapwood, the heart-wood, indeed, only appearing in very old trees. *Specific Gravity*, 0.6660; *Percentage of Ash*, 0.39; *Relative Approximate Fuel Value*, 0.6634; *Coefficient of Elasticity*, 71810; *Modulus of Rupture*, 766; *Resistance to Longitudinal Pressure*, 459; *Resistance to Indentation*, 200; *Weight of a Cubic Foot in Pounds*, 41.51.

USES. — It is used for fuel and in the manufacture of tool handles, and by the Indians for the horns of their fish-nets, etc. The tree has been introduced into cultivation for ornamental purposes, which the beauty of its foliage, flowers and fruit well deserves, and is said to adapt itself better to our eastern conditions of climate than any other Pacific coast tree.

ORDER **LEGUMINOSÆ**: PULSE FAMILY.

Leaves alternate, usually compound, entire and furnished with stipules. *Flowers* with 5 sepals more or less united at the base; petals 5, papilionaceous or regular; stamens diadelphous, monadelphous or distinct and with versatile anthers; pistils single, simple and free. *Fruit* a legume (pod) with mostly albumenless seeds.

GENUS PARKINSONIA, LINNAEUS.

Leaves alternate or fascicled, with short spinescent persistent or caducous stipules, evenly bipinnate with short obsolete or spinescent rachis, the one or two pairs of pinnæ bearing numerous minute opposite entire leaflets without stipels. *Flowers* perfect in slender axillary racemes: calyx campanulate, with five narrow lobes reflexed at maturity, deciduous, valvate in the bud; petals, five, yellow, unguiculate, spreading, the upper broader, within the others and glandular a base of claw; stamens ten, free, slightly declinate, filaments pilose below the middle and the upper one gibbous on the outside: anthers uniform, versatile, with two cells longitudinally dehiscent; pistil inserted at base of calyx tube, with minute terminal stigma, slender filiform incurved style and shortly stipitate ovary containing several anatropous ovules suspended in two ranks from its inner angle. *Fruit* a linear torulose legume, somewhat contracted between the seeds, accuminate at both ends, longitudinally striated, with two, thin coriaceous valves and containing light-brown oblong seeds with slender funicle thin testa and horny albumen.

A genus of three species of trees or shrubs often armed with spines and dedicated to John Parkinson, an English botanist and horticulturist of the seventeenth century.

204. PARKINSONIA MICROPHYLLA, TORR.

MOUNTAIN PALO VERDE, SMALL-LEAF HORSE BEAN.

Ger., *Gebirgspaloverde;* Fr., *Palo Verde de montagne;* Sp., *Palo Verde de montaña.*

SPECIFIC CHARACTERS: — *Leaves* deciduous within a few weeks after their appearance, with common petiole very short or wanting, the pinnæ about 1 in. long, pubescent, with terete rachises and 4–6 pairs of small glaucous sessile entire oblong-orbicular leaflets which are obtuse or somewhat acute at apex, oblique at base and about ⅛ in. long; branchlets stout, rigid and terminating in stout spines. *Flowers* May to June, before the leaves, about a half inch across when expanded, in slender racemes 1 in. or less in length, from the axils of leaves of the previous season, the pedicels jointed a little below the flower; petals yellow, the upper one whitish; stamens exserted, with orange-colored anthers; ovary appressed-silky. *Fruit* 1–3-seeded legumes 2–3 in. long, slightly puberulent, attenuate at both ends, contracted between the seeds, which are about ½ in. in length, with pale brown testa, horny albumen and bright green embryo.

(The specific name is from two Greek words meaning *small leaves.*)

A low tree sometimes attaining the height of 20 ft. (6 m.) with short trunk rarely over 1 ft. (0.30 m.) in diameter, and this dividing near the ground into large crooked sprawling branches, clothed with smooth light yellowish green bark. It forms a wide dome-shaped top close to the ground with a profusion of fine pea-green branchlets and scant glaucous foliage. In many localities it is only known as a sturdy shrub.

HABITAT. — The desert regions of southeastern California, central and southern Arizona and southward into northern Mexico. It is known as a tree only in central Arizona, its nature seeming to demand the heat and conditions of those arid regions which few other trees can endure without irrigation.

PHYSICAL PROPERTIES. — The wood of this tree is rather hard, close-grained, heavy, with poorly defined annual rings and ducts mostly filled with some orange-colored substance making fine reddish dots and streaks in the surface of the finished wood. The heart-wood is of a pale brown color and the abundant sap-wood conspicuously light yellow. *Specific Gravity*, 0.7449; *Percentage of Ash*, 3.64; *Relative Approximate Fuel Value*, 0.7178; *Weight of a Cubic Foot in Pounds*, 46.42.

USES. — Poorly adapted to any use except fuel, for which it is employed in the mining regions of Arizona, and its young branches, serving as very good browse, furnish partial subsistence to herbiverous animals within its arid range.

GENUS PROSOPIS, LINNÆUS.

Leaves bipinnate with one or two (sometimes more) pairs of pinnæ, each with several small, entire, rather rigid leaflets; stipules none and petioles, etc., usually

furnished with minute glands. *Flowers* regular, small, greenish, and usually sessile in cylindrical or globose, axillary, pedunculate spikes or heads; calyx campanulate, with 5 very short teeth valvate in æstivation; petals 5, connate at first below, at length free, distinct, tomentose within (in our species), hypogynous, valvate in æstivation; stamens 10, free, exserted, those opposite the calyx-lobes rather the longer, with oblong, versatile, introse, 2-celled anthers, dehiscent by lateral longitudinal slits, and connective usually tipped with a minute deciduous gland; pistil with filiform style, minute stigma and villose (in the American species) ovary containing many anatropous, suspended ovules in 2 ranks, from the inner angle of the ovary. *Fruit* a linear coriaceous legume, compressed or nearly terete, straight, falcate or twisted into a spiral, indehiscent, with usually thick spongy mesocarp and partitions between the numerous compressed ovate-oblong seeds, which have a crustaceous testa and contain horny albumen, an embryo with short, straight radicle and flat cotyledons.

Genus represented in the United States by small trees and shrubs in the arid regions of the Southwest. (The name *Prosopis* is the ancient Greek name of the *burdock* and is of obscure application here.)

205. PROSOPIS ODORATA, TORR. & FREM.*

SCREWBEAN, SCREW-POD MESQUITE.

Ger., *Schraubenhülse;* Fr., *Cosse de vis;* Sp., *Tornillo.*

SPECIFIC CHARACTERS: — *Leaves* alternate on the new shoots and in fascicles in the axils of the leaves of previous years, canescently puberulent, deciduous, 2–3 in. long, with slender petiole about ½ in. long terminating in a slender spine, and a pair of pinnæ, each furnished with 5–8 pairs of oblong, acute, subsessile leaflets about ½ in. long by ⅛ in. broad and conspicuously recticulate-veined; stipules spinescent and deciduous; branchlets terete, somewhat pubescent the first year, armed with rigid supra-axillary spines arranged in pairs. *Flowers* (in early spring and continuing later), greenish white about ⅛ in. long in dense cylindrical pedunculate spikes 2–3 in. in length; calyx obscurely 5-lobed, pubescent outside, about one quarter as long as the petals, which are narrow, acute, puberulous outside and white tomentose within near apex; stamens exserted; ovary very villous. *Fruit* a narrow yellowish pod which is twisted in to a close spiral of 12–20 turns, from 1–2 in. in length and ⅛ in. in diameter and subsessile in racemose clusters. The pod contains a sweet pulp (mesocarp) which invests the small obovate seeds about $\frac{1}{16}$ in. long with horney albumen.

(The specific name, *odorata*, the Latin for *fragrant*, alludes to the fragrance of the flowers.)

The Screw-pod is a small tree occasionally attaining the height of 30 ft. (9 m.) with wide top and a trunk occasionally 1 ft. (0.30 m.) in diameter, vested in a rather thin cinnamon-brown bark which exfoliates in long, thin, papery scales and strips, giving to old trunks a shaggy appearance similar to that of an old grape-vine. It is often shrubby in habit of growth, but is always quickly recognizable by its curious ringlet-like pods.

HABITAT. — The valley of the Rio Grande in western Texas and westward through New Mexico and Arizona to the Colorado desert in southeastern California, occupying mainly moist bottom-lands and attaining its best development in the vallies of the Gila and lower Colorado rivers.

* *Prosopis pubescens. Benth.*

Physical Properties. — Wood heavy, hard, rather close-grained with very fine medullary rays and not very strong. It is of a rich, pinkish-brown color, streaked with darker and with a clear, light greenish-yellow sapwood. *Specific Gravity*, 0.7609; *Percentage of Ash*, 0.95; *Relative Approximate Fuel Value*, 0.7537; *Coefficient of Elasticity*, 82424; *Modulus of Rupture*, 894; *Resistance to Longitudinal Pressure*, 671; *Resistance to Indentation*, 329; *Weight of a Cubic Foot in Pounds*, 47.42.

Uses. — The wood is used to some extent in making rural fences and is excellent for fuel. The pods, owing to their sweetness and nutritive value, serve as fodder and food for the Indians, though not as valuable as the larger pods of the *Prosopis juliflora*.

Genus ACACIA, Necker.

Leaves variable, in the native American species bipinnate with usually small leaflets in many pairs, but in many of the exotic species the leaflets fall away and the petioles expand, becoming phyllodia; stipules spinescent or inconspicuous. *Flowers* perfect or polygamous, small, generally yellowish or greenish-white in pedunculate globose or cylindrical spikes, each flower in the axil of a minute linear or spatulate bractlet; calyx campanulate, 4-5-toothed or sometimes divided into distinct sepals, or reduced to hairs, valvate in æstivation; petals of the same number as the lobes of the calyx, generally more or less united below or rarely wanting; stamens numerous and indefinite, usually more than fifty, exserted, free or slightly united at base, inserted beneath the ovary, filaments filiform, anthers small, 2-celled, versatile, introrse, longitudinally dehiscent; ovary sessile or stipitate, two or many-ovuled, contracted into a long slender style with minute terminal stigma; ovules anatropous, suspended in two ranks from the inner angle of the ovary. *Fruit* a legume, dehiscent by two valves or indehiscent, continuous within or variously divided, very rarely separating into one-seeded joints, the seeds usually ovate, compressed, without albumen and with thick crustaceous testa.

Genus composed of over 400 species of trees, shrubs and a few herbs of warmer climates, and especially of Australia. About a dozen species are found native in southwestern United States. The name is thought to be derived from the Greek ἀκάζω, to *sharpen*, alluding to the spines with which many of the species are armed.

206. ACACIA DECURRENS, Willd.

Green Wattle, Black Wattle.

Ger., *Grüne Acacie;* Fr., *Acacia vert;* Sp., *Acacia verda.*

Specific Characters: — *Leaves* all bipinnate, of 8-15 pairs of pinnæ, with numerous narrow rather distant leaflets, 1-4 lines in length; branchlets glabrous (or at first slightly pubescent) with prominent angles decurrent from the petioles. *Flowers* (March to May) whitish yellow, in terminal axillary panicled globular heads. *Fruit* pods 3 or 4 in. long, flat, generally less than 4 lines wide and more or less constricted between the seeds; seeds ovate.

The specific name, *decurrens*, the Latin for *running down*, is descriptive of the ridges continuing along the branchlet from base of leaf-stalk.

A beautiful small tree with graceful feathery foliage of various shades of green and symmetrical rounded top. The trunks seldom exceed 15 to 18 in. (0.45 m.) in diameter, and are vested with a bark

which is about $\frac{1}{3}$ in. thick, fine and smooth or with slightly elevated ridges and of a chocolate-brown color.

HABITAT. — A naturalized species growing vigorously in at least the central coast region of California and often thriving in very poor soil. Its native home is in the open forest country of south Queensland, New South Wales, South Australia, Victoria and Tasmania.

PHYSICAL PROPERTIES. — Wood moderately hard and heavy, tough, with numerous fine medullary rays, quite uniformly distributed ducts and indistinct annual rings. It is of a yellowish-brown color with abundant lighter sap-wood. The weight of a cubic foot of dry wood, according to Von Mueller, is from 45 to 48 pounds.

USES. — The wood has hardly attained commercial importance as yet in this country, but is excellent for fuel, and in Australia is used in cooperage, for tool handles, etc. The bark is very valuable for tanning purposes and its fiber is adapted to paper-making. An amber-like gum which is copiously exuded from the tree has been found useful in making jellies and, when mixed with glue, a size for leather.

The cut flowers find a ready sale in the cities of California as "mimosas" and are deservedly popular.

The value of the tree for ornamental purposes is well worthy of mention, as few trees equal it in beauty of foliage. Its usefulness in reclaiming waste lands in the arid regions can hardly be overestimated, as it adapts itself so well to almost all kinds of soils and thrives vigorously in many localities where few other trees can maintain an existence.

MEDICINAL PROPERTIES are found in the astringency of the bark and in the excellent gum arabic produced by the tree.

ORDER **ROSACEÆ** : ROSE FAMILY.

Leaves alternate and with stipules which sometimes fall early or are rarely wanting. *Flowers* regular; sepals 5 or rarely fewer, united at the base and often furnished outside with bractlets resembling the sepals; petals as many as the sepals, or, rarely, wanting, distinct and inserted on a disk which lines the calyx-tube; stamens distinct, numerous (with rare exceptions) and inserted with the petals on the disk of the calyx-tube; pistils 1–many, distinct or united and often combined with the calyx-tube. *Fruit* various, as drupe, pome, achenium, etc.; seeds solitary or few, mostly albumenless, with straight embryo and large thick cotyledons.

Trees, shrubs and herbs, many of great economic value in the production of most useful fruits, beautiful flowers, choice perfumes, etc.

GENUS PRUNUS, TOURNEFORT.

Leaves simple; stipules free and commonly deciduous. *Flowers* perfect, with calyx regular, free and falling away after flowering; petals widely spreading; stamens 15–30; pistil solitary with style terminal or nearly so, and ovary containing 2 pendulous ovules. *Fruit* a drupe, fleshy, with a smooth 1-seeded (rarely 2-seeded) pit.

Trees and shrubs. (*Prunus* is the ancient Latin name of the *plum-tree.*)

207 PRUNUS SUBCORDATA, BENTH.

PACIFIC PLUM, WILD PLUM.

Ger., *Californische Wilde Pflaume;* Fr., *Prune sauvage de Californie;* Sp., *Ciruelo silvestre de California.*

SPECIFIC CHARACTERS: — *Leaves* broadly ovate to orbicular, 1 to 3 inches in length, usually obtuse at apex, and cordate or truncate (rarely cuneate) at base, sharply and finely (sometimes doubly) serrate, somewhat pubescent at first but at maturity glabrous, dark green above, paler and somewhat puberulous beneath coriaceous, with broad midribs and conspicuous veins; stipules caducous; winter buds about ⅛ in. long, acute, with chestnut brown scarious-margined scales, those of the inner rows accrescent; branchlets finely pubescent at first, finally glabrous. *Flowers* appear before the leaves (March or April) from lateral buds, about ⅝ in. across, in two to four-flowered subsessile umbels with slender pedicels from ¼ to ½ in. in length; calyx canpanulate, with lobes rounded at apex, pubescent outside and furnished with pale hairs on inner surface; petals about twice as long as calyx lobes, rounded above and contracted into a short claw at base; stamens glabrous; pistil with slender style and glabrous ovary. *Fruit* ripens in August or September, oblong, ¾ to 1¼ in. long, glabrous, varying from dark red to light yellow, flesh succulent, of excellent subacid flavor and adhering to the pit, which is flattish, acute at both ends, acutely edged on one side and grooved on the other.

(The specific name, *subcordata*, Latin for *somewhat heart-shaped*, refers to the shape of the leaves.)

A small tree, sometimes attaining the height of 20 or 25 ft. (7 m.), and rarely 10 or 12 in. (0.30 m.) in diameter of trunk, but it is usually a considerably smaller tree and often only a scraggy shrub. When a tree it develops a wide top of ash-gray scraggy branches and the bark of trunk, of a dark-gray color, becomes fissured lengthwise into scaly ridges and thin irregular plates.

HABITAT. — The Pacific Plum is found from central California to southern Oregon in the region west of the Sierra Nevadas and Cascade ranges, inhabiting dry rocky hill-sides in considerable abundance and along the banks of streams, reaching its greatest development and producing its best fruit in the northern part of its range.

PHYSICAL PROPERTIES. — Wood hard, heavy, close-grained, with numerous fine medullary rays, showing a satiny surface when polished. It is of a pale-brown color mottled in places with reddish and having thin lighter sap-wood.

USES. — The fruit of this tree is gathered and used in large quanties both as a fresh fruit and variously preserved or dried. It has been found that the quality of the fruit and productiveness of the tree can be materially improved by cultivation and selection.

208. PRUNUS MOLLIS, WALP.*

WOOLLY-LEAF BITTER CHERRY.

Ger., *Haarigblättrige Kirsche;* Fr., *Cerisier à feuilles velues;* Sp., *Cerezo de hojas pelosas.*

SPECIFIC CHARACTERS : — *Leaves* 1–3 in. long, obovate-oblong to oblong-lanceolate, mostly acutish at apex, crenate-serrulate, gradually narrowing to the short pubescent petiole and usually furnished at base with one or more pairs of conspicuous dark glands, dark green and nearly glabrous above at maturity, paler and woolly-pubescent beneath ; stipules pectinate ; branchlets slender, pale pubescent, reddish. *Flowers* opening when the leaves are about half grown, ½ in. or less in diameter, in pubescent 5–10-flowered corymbs, 1 in. or somewhat more in length, with slender pedicels ; calyx pubescent, turbinate, lobes short, entire, obtuse at apex, reflexed ; petals white, obovate, concave, with short claws about 2 lines in length ; stamens with glabrous filaments ; pistil with glabrous and sometimes glandular style and capitate stigma. *Fruit* (ripening from June to August) is a subglobose drupe, ¼ in. or more in diameter, dark red when ripe, with very bitter flesh and ovoid doubly pointed pit carinate on one edge.

(The specific name, *mollis*, the Latin for *soft*, refers to the soft pubescence which covers the new growths and under surface of the leaves.)

The Woolly-leaf Cherry is a tree sometimes attaining the height of 30 or 40 ft. (10 m.) in most favorable forest growth, with trunk 12-18 in. (0.40 m.) in diameter, vested in a smooth dark brown bark marked with light gray horizontal bands and patches and finally peeling up horizontally in rolls and curls and tearing off around the trunk.

HABITAT. — The Woolly-leaf Cherry is found in the coast region of British Columbia, in western Washington and Oregon and at least on the Santa Lucia and San Bernardino mountains of southern California. It reaches its greatest development on Vancouver Island and in the Puget Sound region.

PHYSICAL PROPERTIES. — Wood rather light and hard, not strong, of close grain, with fine medullary rays and susceptible of a smooth satiny polish. It is of a yellow-brown color with a lighter sap-wood occupying about ten annual rings. *Specific Gravity*, 0.4502; *Percentage of Ash*, 0.21; *Relative Approximate Fuel Value*, 0.4493; *Coefficient of Elasticity*, 86055; *Modulus of Rupture*, 679; *Resistance to Longitudinal Pressure*, 460; *Resistance to Indentation*, 80; *Weight of a Cubic Foot in Pounds*, 28.06.

USES. — We believe little use is made of this tree as it is uncommon in size large enough to be of commercial importance though its wood possesses excellent qualities. It is occasionally planted as an ornamental shade tree in northwestern cities. Its bitter fruit was formerly an article of food with the Indians.

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* *Prunus emarginata*, var. *mollis*, Brewer.
Prunus emarginata villosa, Sudworth.

Medicinal Properties we believe are not recorded of this species though it would probably be found to possess tonic and sedative properties, as is the case with the allied eastern Black Cherry and recorded of that species in Part II, p. 18.

Genus PYRUS,* L.

Leaves simple or pinnate: stipules free. *Flowers* white or rose-colored in corymbed cymes; calyx-tube urn-shaped, becoming thick and fleshy in the fruit, limb 5-cleft; petals 5, obovate or roundish, stamens numerous; styles 5 (or sometimes 2–3), and carpels (of the same number) 2-seeded, with papery or cartilaginous endocarp and united with the calyx-tube. *Fruit* a closed pome, fleshy or berry-like. Trees or shrubs. ("*Pyrus*" is the ancient Latin name of the *pear-tree.*)

209. PYRUS RIVULARIS, Dougl.

Oregon Crab or Crab Apple.

Ger., *Oregonischer Holzapfel;* Fr., *Pommier sauvage d'Oregon;* Sp., *Manzano silvestre de Oregon.*

Specific Characters: — *Leaves* simple, ovate-lanceolate, 1–3 in. long, acute or acuminate at apex, wedge-shaped or rounded at base, sharply serrate, or occasionally on vigorous shoots somewhat three-lobed, with prominent mid-rib depressed above and conspicuously reticulated veins and veinlets, pubescent at first but finally glabrous, dark green above, paler and slightly pubescent beneath, with rigid pubescent petioles 1–1 ½ in. long; stipules caducous; winter buds small, about $\frac{1}{16}$ in. in length, brown, and scales with ciliate margins, the accrescent innermost scales red and about ½ in. long when fully grown: branchlets pubescent at first and more or less so during the first summer, but finally lustrous reddish and then brown. *Flowers* ½ to ¾ in. across, in short racemose cymes terminating lateral leafy spurs and with slender pubescent pedicels about ½ in. long and biglandular near the middle; calyx generally pubescent, the lobes acute, pale tomentose within and finally deciduous; petals white, nearly orbicular, with short claws; stamens somewhat shorter than petals; styles 2–4, glabrous. *Fruit* ripens in September and October and persists on the trees long after the leaves have fallen, obovoid to oblong, ½ to ¾ in. in length, varying in color from greenish-yellow to red when ripe, with thin subacid edible flesh and comparatively large seeds.

(The specific name is from the Latin, *rivus, a brook,* alluding to the fact that the tree is found along the banks of streams.)

A tree occasionally attaining the height of 30 or 40 ft. (10 m.) with rigid, slender branches, and trunk 18 in. (0.45 m.) in diameter. Growing as it usually does in the shade of lofty forest trees, it usually develops a leaning trunk and angular branches with irregular top, as the exigencies of the light require, and owing to the humidity of the forests of the northwest, are often loaded with moss and lichens to the very branchlets which bear the leaves and fruit. The bark of trunk is quite thin, scarcely ¼ in. in thickness, of an amber-brown color, and exfoliating in thinnish irregular scales. Often the Oregon Crab is found fruiting when no more than a shrub in stature.

* Sometimes written *Pirus.*

HABITAT. — From Sonoma Co., Cal., northward in rich alluvial and low lands along the banks of streams in the vicinity of the coast, to Alaska and the Aleutian Islands, forming in places extensive and almost impenetrable thickets. It is most luxuriant in the valleys of western Oregon and Washington.

PHYSICAL PROPERTIES. — The wood of this species is heavy, hard and strong, with very fine, close grain and medullary rays, and often marked with parenchymatous dots and streaks. It is of a reddish-brown color with abundant yellowish white sap-wood. *Specific Gravity*, 0.8316; *Percentage of Ash*, 0.41; *Relative Approximate Fuel Value*, 0.8282; *Weight of a Cubic Foot in Pounds*, 51.83.

USES. — The wood of this tree is employed in the manufacture of tool handles, mallets, etc., for which it is excellently suited. The fruit is occasionally used by country folk in the making of cider, and by the Indians as an article of food.

GENUS CRATAEGUS, LINNAEUS.

Leaves simple and generally lobed; stipules free, and, as with the awl-shaped bracts, deciduous. *Flowers* mostly in corymbs, white or rarely rose-colored; calyx urn-shaped with limb 5-cleft, persistent: petals roundish; ovaries 1–5, inferior; styles as many as the ovaries. *Fruit* a fleshy, drupe-like pome containing 1–5 hard 1-seeded carpels and bearing on the summit the persistent calyx-lobes.

Small trees and shrubs armed with thorns, and petioles, calyx-teeth, etc., often beset with glands.

(*Crataegus* is from the Greek κράτος, *strength*, in allusion to the nature of the wood.)

210. CRATAEGUS DOUGLASII, Lindl.

BLACK THORN. WESTERN HAW. BLACK HAW.

Ger., *Schwarze Hagedorn;* Fr., *Aubepine noire;* Sp., *Espino negro.*

SPECIFIC CHARACTERS :—*Leaves* broad-ovate to ovate-oblong, 1–4 in. in length, acute at apex, cuneate at base, finely glandular-serrate excepting at base, often incised or three-lobed towards the apex, puberulous at first but at maturity glabrous, dark green above, paler beneath; petioles short and broad; branchlets glabrous and usually bearing stout thorns ½ to 1 in. long (but sometimes unarmed), reddish at first and finally gray; winter buds about ¼ in. long, lustrous brown and scales ciliate-margined. *Flowers* appear in late spring when the leaves are nearly full grown, in many-flowered cymes with caducous bracts and bractlets, from ⅓–⅝ in. across; calyx more or less pubescent, with lanceolate lobes about as long as the tube and having entire, ciliate or finely glandular serrate margins; petals white, with nearly circular limb and short claw; stamens rather shorter than the petals with stout filaments and pale anthers; pistil with from 2–5 styles about as long as the stamens and generally with pale hairs at the base. *Fruit*, August to September, subglobose, about ½ in. in diameter, lustrous purple black, with sweet edible but thin flesh and thin-walled nutlets grooved on the back.

Crataegus Douglasii var. *rivularis*, Sargent,* is the name given to a form more shrubby in stature, found mainly in the dry interior parts of the continent,

* *Crataegus rivularis*, Nutt.

having paler, narrower, ovate lanceolate leaves, simply serrate membranaceous leaves and somewhat smaller flowers. It was originally described by Nuttall as a distinct species and is still so considered by some botanists.

(The specific name Douglasii, is given in compliment to Mr. David Douglas, who discovered this species and by whom it was introduced into cultivation in England.)

Generally a low, round-headed tree with numerous rigid branches, or often only a shrub, but occasionally attaining the height of 30 or 40 ft. (10 m.) with trunk 18 in. (0.45 m.) or even more in diameter. The bark of trunk is about $\frac{1}{4}$ in. in thickness, of a grayish brown color, and fissured lengthwise into narrow ridges which exfoliate in elongated thickish scales.

Habitat. — British Columbia and southward through Washington and Oregon into northern California and eastward into western Montana to the base of the Rocky Mountains, growing along the banks of streams, sometimes forming almost impenetrable thickets, and reaching its best development in western Oregon and northern California.

In the variety *rivularis* it extends eastward throughout Colorado and southward into New Mexico.

Physical Properties. — Wood heavy, hard, strong, very close-grained, with a satiny surface and having numerous very fine medullary rays. It is of a light reddish-brown color with abundant yellowish-white sap-wood. *Specific Gravity*, 0.6950; *Percentage of Ash*, 0.33; *Relative Approximate Fuel Value*, 0.6927; *Weight of a Cubic Foot in Pounds*, 43.31.

Uses. — The wood is used to some extent in the manufacture of tool handles, etc., for which it is excellent, and the fruit is extensively eaten by the Indians. The tree is planted occasionally for ornamental purposes and thrives well in our Eastern States.

Order MYRTACEÆ : Myrtle Family.

Leaves simple, opposite or alternate without stipules, often pellucid-punctate, coriacious and with marginal vein. *Flowers* usually perfect; calyx-lobes valvate or imbricate or consolidated into a lid; petals 4 or 5 (rarely 6 or wanting) epigynous; stamens numerous; ovary usually inferior (rarely free) 2-many-celled (rarely 1-celled), styles undivided; ovules 2 or many amphitropous. *Fruit* a capsule or berry; seeds without albumen.

A large and important order of about 1800 species, mostly of trees and shrubs of warm climates, generally pervaded with a fragrant and pungent volatile oil and producing various spices, edible fruits, etc.

Genus EUCALYPTUS, L'Heritier.

Leaves thick, coriacious, smooth, mostly alternate though on young shoots generally opposite, entire or nearly so, with thick margin, opposite sides generally alike and arranged vertically by a twist in the petiole, glandular-punctate and of marked flavor and odor when bruised. *Flowers* in 3–15-flowered umbels or solitary in the axils of the leaves, with firm cup-like calyx which opens with a deciduous lid; petals wanting; stamens very numerous, with slender filiform filaments

incurved in æstivation and conspicuously crowning and radiating from the edge of the cup after the lid falls away, and with small intorse anthers; ovary inferior with several cells containing numerous ovules on axial placentæ. *Fruit* a firm woody cup-like, capsule loculicidally dehiscent at the top when mature and liberating many abortive and perfect seeds.

A very interesting and important genus of nearly 150 species of trees, confined in a native state to Australia and the neighboring islands, some of great economic value and among them there are giants attaining the great height of 400 ft. and upwards — the only rivals of our great Sequoias in size. The name *Eucalyptus* is from the Greek. εὖ, *well*, and, καλύπτ ιν, *to cover*, alluding to the stamens being well covered by the lid.

211. EUCALYPTUS ROSTRATA, SCHLECHT.

RED GUM. BIALL.

Ger., *Rothgumi;* Fr., *Gommier rouge;* Sp., *Goma colorada.*

SPECIFIC CHARACTERS :— *Leaves* scattered, 3-6 in. or more in length, lanceolate-sickle-shaped (exceptionally oval-lanceolate) opposite sides colored alike, with rather obscure pinnately spreading lateral veins terminating in a marginal vein which is somewhat remote from the edge, oil dots scanty or obscure; branchlets slender. *Flowers* in axillary 4–14-flowered umbels, with slender terete or slightly compressed peduncles and thin pedicels somewhat shorter than the calyx; calyx-tube semi-globular, 2–2½ lines in diameter, lid somewhat longer than the tube, hemispheric at base and contracting into a sharp or beak-like blunt point; stamens all fertile, about 2 lines long, inflected in the bud and with nearly ovate anthers opening by almost parallel longitudinal slits; stigma not dilated. *Fruit* cup-shaped, scarcely ¼ inch in diameter, with broad protruding rim and usually four (less commonly 3 or 5) highly exserted deltoid valves, and containing small seeds destitute of apendages and very narrow sterile seeds.

The specific name, *rostrata*, is the Latin for *having a beak*, referring to the shape of the calyx lid.

In its native land the Red Gum often attains the height of 100 ft. (30 m.) and occasionally twice that height or more, with a stout trunk sometimes 14 ft. (4 m.) in diameter, vested in a smooth, ashy-gray or brownish bark which exfoliates in irregular plate-like layers. Being a tree introduced in recent years into California it has not had time to attain very large dimensions here.

HABITAT. — A thoroughly naturalized tree in California where it springs up abundantly from self-sown seeds. Its native home is in Australia, where it is found in moist soil along the river banks or in alluvial valleys throughout nearly the whole continent, but not ascending to high altitudes and generally abundant near the coast.

PHYSICAL PROPERTIES. — Wood dense, hard, heavy, strong, of flexuous grain, susceptible of a handsome polish, exceedingly durable in contact with the soil, and said to be next to the Australian Jarrah wood in resisting the attacks of the teredo and boring insects. The wood is of a brick-red color (whence the name Red Gum) with rather scant lighter sap-wood. *Specific Gravity*, 0.858 to 1.005; *Weight of a Cubic Foot in Pounds*, 53½-62½.

Uses. — One of the most valuable of the many Eucalyptus woods for fuel, and in Australia, on account of its great durability and power of resisting the attacks of destructive insects and crustacea, is highly prized for railroad ties, telegraph poles, posts, piles, paving blocks, material for ship building, etc. It makes a handsome furniture, too, and a ton of the dry wood has been found to yield 2½ lbs. of pure potash. Its flowers yield an abundance of honey.

Medicinal Properties. — The fresh bark contains from 7-8% of kino, and for therapeutic purposes that produced by this tree is regarded as being among the most efficient of its kind.

From the wood kino-tannin and kino-red are procured, the large percentages of these two substances in this wood being, as far as known, only rivaled by the Jarrah wood (*Eucalyptus marginata*), and it is in the presence of these substances that we have a clue to the extraordinary durability and power to withstand destruction by insects, etc., of these two timbers.*

Order **OLEACEÆ**: Olive Family.

Leaves opposite and simple or pinnately compound. *Flowers* monopetalous (rarely apetalous or polypetalous); calyx 4-cleft, toothed or entire, or sometimes wanting, corolla regular, 4-cleft (or sometimes 4-petalous, or even wanting altogether); stamens only 2 (or rarely 4); ovary 2-celled with usually two suspended ovules in each cell. *Fruit* fleshy or capsular, containing 4 (or fewer) seeds.

Represented by trees and shrubs.

Genus FRAXINUS, Tournefort.

Leaves petioled, oddly-pinnate, with 3–15 toothed or entire leaflets. *Flowers* small, racemed or panicled, from the axils of the last year's leaves, the American representatives dicœcious and apetalous; calyx and corolla, when present, as described for the order; anthers large, linear or oblong; style single, stigma 2-cleft. *Fruit* a 1–2-celled, flattened samara, winged at the apex, 1–2 pendulous seeds in each cell.

(*Fraxinus* is the ancient Latin name of the *ash;* supposed to be from the Greek φράξις, *a separation,* alluding to the facility with which the wood splits.

212. FRAXINUS VELUTINA, Torr.

Leather-leaf Ash.

Ger., *Lederblättrige Esche;* Fr., *Frêne à feuilles de cuir;* Sp., *Fresno de hojas de cuero.*

Specific Character: — *Leaves* very variable, from 3–6 or 8 in. in length and with 3–9 leaflets which vary from lanceolate to oval, 2–4 in. long, with petiolule to nearly sessile, long, taper-pointed, generally acuminate though sometimes rounded at apex, wedge-shaped to unequally rounded at base, entire or remotely serrate above the middle, glabrous or variously tomentose especially beneath, thick coriaceous (especially with trees growing on dry mesas) dark green above,

* Baron Ferd. Von Mueller, *Eucalyptographia.*

paler beneath, prominent veins arcuate near the margin ; branchlets terete and at first pale-pubescent or more or less densely tomentose. *Flowers* appear when the leaves unfold in short compact panicles, from buds in the axils of the leaves of the previous year, the staminate and pistillate on different trees ; calyx cup-shaped, larger in the pistillate flower than in the staminate ; corolla absent ; stamens two, with short filaments and oblong apiculate anthers. *Fruit* samaræ, maturing by early autumn, in paniculate bunches, spatulate-oblong, about 1 in. in length, subtended by the persistent calyx, terete at base — the seed-bearing portion — and expanded above into a wing from $\frac{1}{8}$ to $\frac{1}{4}$ in. wide, varying from acute to emarginate at apex and tipped with the remnants of the style.

The specific name, *velutina*, is from a Latin root designating the *velvety pubescence* of under side of leaves, but applicable to only one of the extensive forms of the species.

A tree occasionally attaining the height of 60 or 70 ft. (20 m.) with a trunk 18 in. to 2 ft. (0.50 m.) in diameter, but usually considerably smaller. The bark of the trunk is of a light gray color and becomes fissured with age into rather firm longitudinal and obliquely connecting ridges similar to the bark of the White Ash.

HABITAT. — Western Texas and westward across southern New Mexico and Arizona, southern Nevada and the Petamint Mountains in southeastern California, confined mainly to the neighborhood of mountain streams but occasionally on dry mesas.

PHYSICAL PROPERTIES. — Wood heavy, not strong, rather soft and close-grained, with many fine medullary rays and annual rings well defined by the arrangement of the large open ducts. It is of a light brown color with abundant lighter sap-wood occupying forty or fifty layers of growth. *Specific Gravity*, 0.6810; *Relative Approximate Fuel Value*, 0.6768; *Percentage of Ash*, 0.62; *Coefficient of Elasticity*, 60119; *Modulus of Rupture*, 622; *Resistance to Longitudinal Pressure*, 385; *Resistance to Indentation*, 210; *Weight of a Cubic Foot in Pounds*, 42.44.

USES. — A useful wood in the local manufacture of ax and other tool handles, wagon wheels, etc. We have seen the tree growing for shade and ornamental purposes along the streets of the larger towns in Arizona, for which use it seems to be admirably adapted.

ORDER PROTEACEÆ : PROTEA FAMILY.

Leaves persistent, alternate or scattered (rarely opposite), entire or variously pinnate, exstipulate. *Flowers* usually perfect, terminal or axillary, variously clustered or rarely solitary; perianth inferior, of usually 4 regular or irregular valvate segments; stamens 4, inserted on and shorter than the segments of the perianth: introrse, the connective continuous with the filaments, if any; pistil solitary, free, with terminal filiform style, and 1-celled ovary containing from one to several ovules. *Fruit* very variable in form, but 1-celled and with exalbuminous seeds.

Order represented by about 950 species of trees and shrubs, rarely perennial herbs, of the tropical and south temperate regions, and largely represented in Australia and South Africa. The order is more noted for the richness and elegance of its flowers than for useful properties.

GENUS GREVILLEA, R. BR.

Leaves alternate and of many forms. *Flowers* perfect, mostly in pairs, in racemes or umbel-like clusters, rarely reduced to a single pair; calyx with four recurved sepals; petals wanting; stamens consist of four anthers sessile upon the sepals; pistil solitary with generally stipitate, 2-ovuled ovary and a single long filiform style which is curved downward in the bud, the loop protruding first from a slit between two of the sepals, and the dilated summit being released afterwards. *Fruit* a coriaceous (rarely woody) and usually oblique follicle, dehiscent along the upper margin; seeds one or two, often winged.

A genus of nearly 200 species of trees and shrubs confined almost exclusively to Australia. The name is given in compliment to C. F. Greville, a patron of botany.

213. GREVILLEA ROBUSTA. CUNN.

SILKY OAK, GREVILLEA.

Ger., *Starke Grevillea;* Fr., *Grevillea robuste;* Sp., *Grevillea robusta.*

SPECIFIC CHARACTERS: — *Leaves* pinnate, 6–12 in. long, with 11–21 leaflets, which are deeply and irregularly incisely lobed, having incurved margins, and are glabrous or nearly so above and silvery pubescent beneath. *Flowers* (in early spring) bright orange and turning to one side of the axis in glabrous racemes which are 3–5 in. long and solitary or clustered on short leafless branchlets; pedicels about ⅛ in. long; stipe somewhat oblique; sepals four, long spatulate, bearing the anthers near their summits and finally falling away after liberating the retained summit of the style; style about ⅜ in. long, with small stigmatic disk somewhat oblique. *Fruit* a very oblique follicle about ¾ in. long, tipped with the long tail-like style and containing two seeds winged all round.

The specific name, *robusta*, is from the Latin, descriptive of the *robust* habit of the tree as compared with other representatives of the genus.

A highly ornamental and graceful tree of very rapid growth and well adapted to street-side and park adornment in the Southwest. In its native land it attains the height of 100 ft. (30 m.) or more, but only small or medium-size trees are yet to be found in this country.

HABITAT. — Indigenous to the subtropical regions of eastern Australia, New South Wales and Queensland, and naturalized about some of the cities and villages of southern California.

PHYSICAL PROPERTIES. — Wood rather light, soft, elastic, easily splitting, durable, with numerous conspicuous medullary rays, quite uniformly distributed ducts and annual rings not well defined. It is of a light reddish color with lighter sap-wood and of peculiar beauty owing to the conspicuous medullary rays — the "silver grain" of wood-workers. It is on account of these conspicuous medullary rays that the name "Oak" has been wrongly applied to this tree. *Specific Gravity*, 0.564; *Weight per Cubic Foot, about* 36 *lbs.*

USES. — The wood is in demand in Australia for the manufacture of casks, butter boxes, etc., and in cabinet-making.

The tree in California as yet is mainly important as a handsome and graceful ornamental tree, well adapted to arid regions owing to its

power to resist drouth. Its "rich golden tresses" of flowers yield an abundance of honey. It proves, however, to be a short-lived tree in this its adopted land. Its phenominally rapid growth of the first few years proves to be in a measure "a beautiful disappointment," for its limbs easily break with the force of the winds and it commences its decline. This fault known, however, is easily met and the tree occupies a promising place of value.

ORDER **CUPULIFERÆ**: OAK FAMILY.

Leaves alternate, simple, straight veined; the stipules, forming the bud-scales, deciduous. *Flowers* monœcious, apetalous. *Sterile flowers* in clustered or racemed catkins (or in simple clusters in the Beech); calyx regular or scale-like; stamens 5–20. *Fertile flowers* solitary, clustered or spiked, and furnished with an involucre which forms a cup or covering to the nut; calyx-tube adherent to the ovary, its teeth minute and crowning the summit; ovary 2–7-celled with 1–2 pendulous ovules in each cell, but all of the cells and ovules, except one, disappearing before maturity; stigmas sessile. *Fruit* a 1-celled, 1-seeded nut, solitary or several together and partly or wholly covered by the scaly (in some cases echinate) involucral cup or covering; seed albumenless, with an anatrapous, often edible, embryo; cotyledons thick and fleshy.

Order is represented by trees and shrubs of wide geographic distribution.

GENUS QUERCUS, LINNAEUS.

Flowers greenish or yellowish. *Sterile flowers* in loose, slender, naked catkins, which spring singly or several together from axillary buds; calyx 2–8-parted or cleft; stamens 3–12; anthers 2-celled. *Fertile flowers* with ovary nearly 3-celled and 6-ovuled, two of the cells and 5 of the ovules being abortive; stigma 3-lobed; involucre developing into a hard, scaly cup around the base of the nut or acorn, which is 1-celled, 1-seeded.

(*Quercus* is the ancient Latin name for the Oak, supposed to be from the Celtic *quer*, *fine*, and *cuez*, *tree*.)

214. QUERCUS DOUGLASII, H. & A.

BLUE OAK. CALIFORNIA ROCK OAK.

Ger., *Blaueiche;* Fr., *Chêne bleu;* Sp., *Roble azul.*

SPECIFIC CHARACTERS:—*Leaves* extremely variable in form but alike in being deciduous, of a distinctly blue-green color, pubescent at least beneath, and they are from 1 to 3 in. long, mostly oblong or obovate, from acute to rounded or subcordate at base, acute or rounded at apex, sinuate-dentate with acute rigid spinescent teeth or sinuate-lobed with rounded lobes and sinuses, or sometimes entire, reticulate-veined; petioles stout, about ¼ in. long; leaf buds ⅛ to ¼ in. long, pubescent; branchlets stout, hoary tomentose. *Flowers* appear in early spring, the staminate in hairy aments with linear-lanceolate bracts; calyx with hairy lasiniate lobes, pale yellow; stamens with slender filaments and yellow exserted anthers, pistillate flowers hoary tomentose. *Fruit* acorns maturing the first year, sessile or nearly so, arranged singly or in pairs, cup light green, shallow, thin, with small acute thin pointed scales and enveloping only the base of the nut, which is ¾ to 1¼ in. long and from ½ to nearly ¾ in. broad, oval to long-oblong and often ventricose with narrow base, shining green at first but drying to a dark brown.

The specific name, *douglasii*, commemorates the name of its discoverer, the indefatigable botanical explorer Mr David Douglas.

This beautiful oak seldom attains a greater height than 75 ft. (25 m.), or its trunk a greater thickness than 3 or 4 ft. (1 m.). Its trunk is

generally short, as it divides within a few feet of the ground into two or a few large limbs, and then develops a wide rounded symmetrical top generally depressed in the center. With its dense blue-green foliage and its branches generally festooned with the interesting gray-green lichen (*Ramalia reticulata*), so abundant in the region in which it grows, this is indeed a beautiful tree. The bark of trunk is generally of a pale-gray color, but darker on trees in shaded valleys. It becomes fissured with age into shallow ridges and exfoliates in long friable scales.

Habitat. — The Blue Oak is scattered over the foot-hills and slopes of central California, never seeming to crowd each other sufficiently to interfere with characteristic habit of growth, and in company with *Q. lobata* and *agrifolia* imparting to many a landscape the appearance of beautiful parks and large open apple orchards. It ranges as far north as the upper valley of the Sacramento river and southward to the Mohave desert, ascending the western slopes of the Sierra Nevada mountains to about 4,000 ft. altitude, and probably attaining its largest dimensions in the Salinas valley.

Physical Properties. — Wood very heavy, hard and strong, with numerous and (for an oak) rather small medullary rays, and owing to quite even distribution of open ducts the annual rings are not well defined — in these two features quite different from most of the oaks. The wood is of a dark-brown color and sap-wood yellowish white. *Specific Gravity*, 0.8928; *Percentage of Ash*, 0.84; *Relative Approximate Fuel Value*, 0.8853; *Coefficient of Elasticity*, 77166; *Modulus of Rupture*, 993; *Resistance to Longitudinal Pressure*, 567; *Resistance to Indentation*, 374; *Weight of a Cubic Foot in Pounds*, 55.64.

Uses. — The short trunks of this tree are poorly adapted to commercial purposes, excepting for fuel, for which they are excellent.

215 QUERCUS ENGELMANNI, Greene.

Engelmann Oak.

Ger., *Eiche von Engelmann*; Fr., *Chêne d'Engelmann*; Sp., *Roble de Engelmann*.

Specific Characters: — *Leaves* persistent until the new leaves of the following spring, oblong to obovate, ½ in. long, mostly rounded or cordate at base and obtuse or rounded at apex, and with entire (though occasionally with coarsely serrate-dentate) margins, rufous-tomentose at first but finally glabrous, blue-green above, paler and sometimes puberulous beneath, thick coriaceous and with rather obscure veinlets; petioles about ¼ in. long; leaf-buds about ¼ in. long, puberulous; branchlets stout, hoary pubescent during the first year. *Flowers* appear in early spring, the staminate in slender aments, ⅔ in length; calyx light yellow, pilose outside; stamens with slender filaments and exserted anthers; pistillate flowers

pale tomentose and with short, slender peduncles. *Fruit* acorns maturing the first year, generally with slender peduncles but sometimes sessile, a deep saucer-shaped light brown cup with pale tomentose scales tuberculate at base, about ⅛ enveloping the oblong or ovoid nut which is 1 in. or less in length and about ½ in. broad, dark brown and longitudinally striated at first, but finally drying to a light brown; cotyledons yellow.

The specific name, *Engelmanni*, is given in compliment to the physician and botanist, Dr. Geo. Engelmann.

The Engelmann Oak does not often attain a greater height than 50 or 60 ft. (16 m.). Its trunk is rarely thicker than 2 or 3 ft. (0.75 m.), and this divides quite regularly a few feet above the ground into two large, widely diverging branches which, by repeated bifurcation in this way, form a rounded dome-shaped top. The bark of trunk is of a light-gray color, fissured into longitudinal ridges, and exfoliating in elongated friable scales. Its foliage is of a conspicuously bluish cast.

HABITAT. — A tree of very limited distribution, being confined mainly to the seaward slopes of the Sierra Madre and Santa Ana mountains of southwestern California, easily distinguished from the trees with which it grows by its bifurcate branching and the distinctly bluish cast of its foliage.

PHYSICAL PROPERTIES. — Wood very heavy, hard, strong, and close-grained, but rather brittle, with very dark-brown heart-wood and lighter abundant sap-wood. *Specific Gravity*, 0.9441; *Percentage of Ash*, 2.60; *Relative Approximate Fuel Value*, 0.9195; *Coefficient of Elasticity*, 85739; *Modulus of Rupture*, 719; *Resistance to Longitudinal Pressure*, 434; *Resistance to Indentation*, 439; *Weight of a Cubic Foot in Pounds*, 58.94.

USES. — This wood makes an excellent fuel, which is the only use to which it is applied, owing to its limited distribution and abundance.

216. QUERCUS MACDONALDI, GREENE.

MACDONALD OAK.

Ger., *Eiche von MacDonald;* Fr., *Chêne de MacDonald;* Sp., *Roble de MacDonald.*

SPECIFIC CHARACTERS: — *Leaves* deciduous, oblong to obovate in outline, 1½–3½ in. long, sinuate-lobed, with narrow and rounded or acute sinuses and broad rounded or acutish and mucronulate lobes, wedge-shaped or rounded at base, finely pubescent at first but finally glabrous above and stellate-pubescent beneath; petiole rather slender, pubescent, ½ in. or less in length; branchlets slender, ferruginous pubescent the first year; winter buds ⅛ in. or less in length, scales ciliolulate. *Flowers* appear in April, the staminate in pubescent aments 1–2 in. in length; calyx-lobes ciliate with pale silky hairs; pistillate flowers sessile or nearly so. *Fruit* acorns maturing the first year, single or in pairs, sessile, with ovoid-oblong nut, ¾ to 1¼ in. long, acute or obtuse at apex, with a prominent terminal nib, narrow at base and about ⅛ enveloped in the deep hemispherical cup which is of a

yellow-brown color, conspicuously tuberculate, pubescent, and the thin pointed tips of the scales closely appressed.

The specific name, *macdonaldi*, is given in compliment to Hon. James M. MacDonald, a promoter of botanical research in California.

The MacDonald Oak is generally considered a small tree and rarely surpassing 20 ft. (6 m.) in height or 1 ft. (0.30 m.) in diameter of trunk and such we understand to be its habit on the island of Santa Cruz where it was discovered, but on the island of Santa Catalina I have seen a tree of the species 5 ft. (1.50 m.) in diameter of trunk with wide top of long horizontal branches shading an area 75 ft. across. It is the largest tree on the island.

HABITAT. — The islands of Santa Cruz and Santa Catalina, off the coast of southern California, with a variety (*elengantula*) of rather doubtful tenure on the adjacent mainland.

PHYSICAL PROPERTIES. — Wood of the MacDonald Oak is heavy, hard, strong, with large medullary rays and annual rings well defined by the arrangement of large open ducts. The heart-wood is of a rich brown color, but only found in trunks of considerable age, and the abundant sap-wood is creamy white.

USES. — This oak is too rare and local to be applied to any particular use.

NOTE. — There is a disposition with some botanists to consider this tree as merely a form of the *Quercus dumosa*, but after a careful study of the tree on Santa Catalina island I cannot agree with that opinion. Its deciduous nature and stately form, as there seen, with larger leaves, some almost suggesting the leaves of the eastern White Oak, at once impress you with its distinctness from the humble persistent-leaved and shrub-like *Q. dumosa* which covers the neighboring slopes. It is true that some of its smallest leaves do approximate in appearance some of the larger leaves of the *Q. dumosa*, but the resemblance is no more marked here than we see between the leaves of various other trees known to be distinct.

ORDER **BETULACEÆ**: BIRCH FAMILY.

Leaves simple, alternate, straight-veined and furnished with stipules which fall away early. *Flowers* mostly naked, monœcious, both kinds in catkins 2 or 3 together under a 3-lobed bract or scale. *Sterile flowers* with distinct stamens and 2-celled anthers. *Fertile flowers* with two thread-like stigmas, and a 2-celled ovary, each cell containing 2 pendulous ovules, becoming by abortion in *Fruit*, a small, 1-celled, 1-seeded nutlet, often with membranous wings; seed anatropous, albumenless, with flattish, oblong cotyledons which become foliaceous in germination.

Trees or shrubs, with bark which separates more or less easily into thin layers.

GENUS ALNUS, TOURNEFORT.

Leaves deciduous, alternate, generally serrate, pinnately veined, furnished with caducous stipules which inclose them in the bud, fall in autumn while still green

in color. *Flowers* expand in early spring with or before the leaves (or rarely in autumn) in pedunculate aments, formed during the summer or autumn of the previous season, from the axils of leaves or bracts and remaining naked and erect, monœcious, apetalous, sessile, one to six together beneath the peltate short-stalked scales of the ament. Staminate aments long, pendulous and generally in panicles, the scales of the ament usually 2–4-flowered, the flowers subtended by minute bractlets adnate to the base of the scale ; calyx usually 4-parted; stamens of the same number or exceptionally half as many as the calyx-lobes and opposite them, filaments erect with introrse 2-celled anthers longitudinally dehiscent. Pistillate aments erect from axils below those producing the staminate aments, ovoid or oblong, scales fleshy and beneath each are usually two flowers subtended by minute bractlets, these aments becoming in *Fruit* ovoid, oblong or subglobose strobiles with scales thickened at apex, woody and closely imbricated over the minute brown compressed nutlets slightly or not at all winged, tipped with the remnants of the style and containing a single suspended exalbuminous seed. The strobiles persist for a time after liberating the seed, with truncate thickened scales divergent.

Genus consists of trees and shrubs with astringent bark, watery juice and soft wood very durable in water. *Alnus* is the ancient Latin name of the Alder.

217. ALNUS OREGONA, NUTT.*

OREGON ALDER, RED ALDER.

Ger., *Oregonische Erle;* Fr. *Aune d'Oregon;* Sp., *Aliso de Oregon.*

SPECIFIC CHARACTERS: — *Leaves* from 3–5 in. long, ovate or elliptical, acute at apex, abruptly wedge-shaped or rounded at base, crenately lobed, the lobes minutely glandular dentate, dark green and glabrous or nearly so and with impressed veins above, rusty pubescent and with prominent veins and veinlets beneath; petioles $\frac{1}{2}$–$\frac{3}{4}$ in. in length, orange colored and slighly grooved; branchlets more or less hoary tomentose; winter buds about $\frac{1}{8}$ in. long, dark red, scurfy pubescent. *Flowers* open in very early spring, before the leaves, the stamenate in aments from 4–6 in long when fully expanded, arranged in terminal racemes, red-stemmed. They appear the previous summer and remain dormant during the winter, then about $1\frac{1}{4}$ in. long and $\frac{1}{8}$ in. thick, covered with closely appressed dark reddish brown lustrous scales. Scales of ament when in flower reddish yellow, ovate, acute, glabrous; calyx yellow and with four rounded lobes; stamens four, rather longer than the calyx lobes and with yellow anthers. Pistillate aments from $\frac{1}{4}$–$\frac{1}{2}$ in. long and $\frac{1}{16}$ in. thick, in stout racemes, and with dark red scales; styles red. *Fruit* cones $\frac{1}{2}$–1 in. long, round-ovoid to oblong with stout orange-colored peduncles about $\frac{1}{4}$ in. long and truncate scales thickened at apex; nutlets obovate or orbicular with narrow membranaceous wings.

The Red Alder occasionally attains the height of 70 or 80 ft. (22 m.) and 3 ft. (0.90 m.) in diameter of trunk, but generally is a considerably smaller tree. When growing apart from other trees it developes a narrow ovoid head of rather slender branches. The bark of trunk is thin, scarcely more than $\frac{1}{4}$ in. in thickness, smooth excepting for very slight transverse ridges and excrescences and is of a more or less mottled pale gray color or often nearly white.

HABITAT. — The Red Alder ranges from the vicinity of Sitka in Alaska southward in the coast region to the Santa Inez mountains in California, preferring the moist soil along the courses of streams and reaching its best development in western Oregon and Washington.

* *Alnus rubra*, Bongard.

Physical Properties. — Wood light, soft, brittle, with many fine and occasionally large medullary rays, close grain, easily worked and susceptible of a beautiful polish. It is of a light brown color with abundant buff-white sap-wood which quickly assumes a brownish tint upon exposure to the air. *Specific Gravity*, 0.4813; *Percentage of Ash*, 0.42; *Relative Approximate Fuel Value*, 0.4793; *Coefficient of Elasticity*, 106046; *Modulus of Rupture*, 811; *Resistance to Longitudinal Pressure*, 415; *Resistance to Indentation*, 117; *Weight of a Cubic Foot in Pounds*, 29.99.

Uses. — Used in Washington and Oregon in the manufacture of furniture, for wooden ware, etc., and in Alaska is a favorite wood with the Indians in making their dug-out canoes.

Order **SALICACEÆ**: Willow Family.

Leaves alternate, simple, undivided and furnished with stipules, which are either scale-like and deciduous, or leaf-like and persistent. *Flowers* dioecious, both kinds in catkins, one under each bract or scale of the catkin and destitute of both calyx and corolla, or the former represented by a gland-like cup; ovary 1 to 2 celled; styles wanting, or 2 and short; stigmas often 2-lobed. *Fruit* a 1 or 2-celled, 2-valved pod, with numerous seeds springing from two parietal or basal placentæ and furnished with long, silky down; seeds ascending, anatropous, with albumen; cotyledons flat.

Trees or shrubs of rapid growth, light wood and bitter bark.

Genus POPULUS, Tournefort.

Leaves broad, more or less heart-shaped or ovate, and with long and often vertically compressed petioles. *Flowers* appearing before the leaves in long, drooping, lateral, cylindrical catkins, the scales of which are furnished with a fringed margin; calyx represented by an oblique, cup-shaped disk with entire margin; stamens, 8–30 or more, with distinct filaments; pistil with very short, bifid style, and large 2-lobed stigma. *Fruit* as described for the order.

Genus represented mostly by rather large trees, and the name is a Latin word, meaning *people*, applicable either from the fact that these trees are often set along public walks, or in allusion to the tremulous motion of the leaves, which are in constant agitation like a crowd of people.

218. POPULUS TRICHOCARPA, T. & G.

Black Cottonwood.

Ger., *Schwarze Pappel;* Fr., *Peuplier noir;* Sp., *Alamo negro.*

Specific Characters: — *Leaves* broad-ovate to oblong-lanceolate, 2–4 in. long (exclusive of petioles), rounded or slightly heart-shaped at base, acuminate, finely crenate-serrate with small incurved gland-tipped teeth, pale pubescent when young, but at maturity lustrous dark green above, pale or rusty beneath and conspicuously reticulate veined, glabrous excepting along the veins above; petioles 1–2 in. long slender, terete puberulous; leaf buds long-pointed and shining, fragrant-viscid; branchlets pubescent at first and angled, especially the more vigorous ones, but finally terete and lustrous with elevated lunate leaf scars. *Flowers* in early spring in pedunculate pendulous aments; the staminate 1½–2 in. long, densely flowered and with glabrous rhachis; the pistillate aments 2–3 in. long (becoming 6) and with pubescent rhachis; scales dilated, deeply fimbriated, nearly

glabrous, and falling away before the ripening of the fruit; stamens 20–60, inserted on a broad glabrous disk; ovary subglobose, hoary tomentose, and with three broadly dilated and lobed nearly sessile stigmas and inclosed at base with cup-shaped glabrous disk. *Fruit*, capsules nearly sessile, subglobose, pubescent, about 3 lines in diameter, 3-valved; seed about 1 line long, light brown, and furnished with a tuft of white hairs.

The specific name, *trichocarpa*, is from Greek roots indicating *hairy fruit*, and referring here to the hairy capsules.

One of the largest of the genus, this Cottonwood sometimes attains the height of nearly 200 ft. (60 m.) with sturdy trunk 6 or 8 ft. (2 m.) in diameter. When growing apart from other trees its trunk divides into few large branches which ramify into a broad open top. The bark of the old trunk is of a grayish-brown color, furrowed lengthwise by deep clefts which enter nearly to its cambium layer and between which the long, rounded, firm ridges may become 2 in. or more in thickness.

HABITAT. — The *Populus trichocarpa* ranges from Alaska southward along the banks of streams and in low-lands throughout all the coast region to northern California, and in these localities attains its greatest dimensions, being here the largest of the broad-leaved trees. It is found as a smaller tree to the southward among the mountains of California ascending the cañons of the Sierra Nevadas to an altitude of about 6,000 ft. but reaching its southernmost limit in the San Bernardino mountains. It is also found on the larger islands lying off the coast of California.

PHYSICAL PROPERTIES. —Wood soft, light, not strong, easily worked, excepting for the tendency of the heart-wood to dull tools — a trait common to most of the representatives of the genus. It is of a light-brown color, mottled or streaked with darker, and the sap-wood is nearly white. *Specific Gravity*, 0.3814; *Percentage of Ash*, 1.27; *Relative Approximate Fuel Value*, 0.3766; *Coefficient of Elasticity* 111694; *Modulus of Rupture*, 665; *Resistance to Longitudinal Pressure*, 390; *Resistance to Indentation*, 63; *Weight of a Cubic Foot in Pounds*, 23.77.

USES. — In Washington and Oregon this wood is used quite extensively in the manufacture of bowls and general wooden ware, the staves of sugar barrels, etc., and it is said that the Indians of British Columbia use it for making their canoes, and those of northern California and Oregon formerly used the tough roots in the manufacture of hats and baskets.

MEDICINAL PROPERTIES. — The peculiar exudation of the leaf-buds of this species, though not specifically mentioned in medicine, doubtless possesses the same properties that are common to other representa-

tives of the genus and mentioned under *Populus balsamifera.* Part II, p. 39.

GYMNOSPERMÆ.

Flowering, exogenous plants with *leaves* chiefly parallel-veined and cotyledons frequently more than two. *Flowers* diclinous and very incomplete; pistil represented by an open scale or leaf, or altogether wanting, with ovules naked, fertilized by direct contact with the pollen, and seeds at maturity naked — without a true pericarp.

ORDER **CONIFERÆ**: PINE FAMILY.

Leaves mostly awl-shaped or needle-shaped, evergreen, entire and parallel-veined. *Flowers* monœcious, or rarely diœcious in catkins or cones, destitute of both calyx and corolla: stamens one or several (usually united); ovary, style and stigma wanting; ovules one or several at the base of a scale, which serves as a carpel, or on an open disk. *Fruit* a cone, woody and with distinct scales, or somewhat berry-like, and with fleshy coherent scales, seeds orthotropous, embryo in the axis of the albumen.

Trees or shrubs with a resinous juice.

GENUS CUPRESSUS, TOURNEFORT.

Leaves persistent, small, scale-like, decussately opposite, thick, rounded or keeled, adnate to and decurrent upon the stem, usually glandular-pitted on the back, appressed or slightly spreading at the pointed or rounded apex, margin entire or denticulate; leaves on vigorous young shoots commonly awl-shaped or linear-lanceolate and spreading; branchlets not forming flat sprays. *Flowers* appear in early spring, monœcious, in small catkins terminating the leafy branchlets; the staminate aments oblong or cylindrical, consisting of a few pairs of decussately opposite, yellowish ovate or orbicular subpeltate scales attached to the under sides of each of which are two to six subglobose pendulous anther-cells opening by a longitudinal slit: pollen-grains simple. The pistillate flowers terminate short branchlets, subglobose; scales thick, ovate acute and bearing attached to their bases on the inner surface generally numerous, erect, orthotropous bottle-shaped ovules. *Fruit* a subglobose, short-stalked, rugose, woody cone, generally maturing the second year, scales closely valvate, peltate, polygonal in outline at apex, flattened and bearing more or less prominent central bosses, at maturity opening along their margins and persisting after liberating their numerous irregularly compressed acutely angled thick-coated seeds, which are borne in several rows on the base of the scale; embryo erect in fleshy albumen, cotyledons usually two.

Genus consists of resinous trees with generally fragrant wood of considerable economic value, especially in Japan. About a half dozen species are found in the United States along the Pacific slope.

(*Cupressus* is the classical Latin name of the Cypress tree.)

219. CUPRESSUS MACNABIANA, MURR.

MACNAB CYPRESS.

Ger., *Cypresse von Macnab;* Fr., *Cypres de Macnab;* Sp., *Cipres de Macnab.*

SPECIFIC CHARACTERS:—*Leaves* conspicuously glaucous, and white-glandular-pitted on the back, ovate, acute or rounded at apex, closely appressed, long pointed and spreading on young shoots, $\frac{1}{16}$ in. or less in length; branchlets slender and numerous. *Flowers* appear in March or April; the staminate nearly cylindrical and about $\frac{1}{16}$ in. long with rounded scales (connectives); the pistillate about the same size but scales more pointed and spreading. *Fruit,* cones small, subglobose, $\frac{1}{2}$ in. in diameter or slightly more, rich brown (or grayish with age) composed of 6 or rarely 8 scales each furnished with a rather thin but wide-based

boss, the lowermost recurved and those at the apex incurved; seeds numerous, brown, about 2 lines in length, irregular by mutual compression.
(The specific name, *Macnabiana*, is given in compliment to James MacNab, a distinguished Scotch botanist and horticulturist.)

A low tree rarely 30 ft. (9 m.) in height with bushy top and trunk rarely more than 15 in. (0.38 m.) in diameter, covered with rather thin, reddish-brown bark, which becomes fissured into flat, longitudinal and obliquely connecting ridges and exfoliates in long strip-like scales.

Often it is hardly more than a shrub in stature, branching from near the ground. Then again trees are found, small in stature, but having the appearance of age in thin, gnarled and distorted trunks similar to the trees dwarfed by the Japanese. It is a tree of striking appearance owing to its numerous slender branchlets and the peculiar grayish tint imparted to its foliage by the many white glands with which it is supplied. Upon closer observation the foliage is found to possess a peculiarly delicious fragrance, described by Miss Alice Eastwood* as "somewhat like sandal-wood but sweeter, not so strong and with a flavor of pineapple." This odor is only observable when the leaves are fresh.

HABITAT. — A rare and very local tree being generally known as occurring only in a few localities in Lake, Napa and Mendocino Counties, California, though originally described from specimens collected "at the southern base of Mt. Shasta," in which locality it has not been found since. It is scattered over dry hill-sides and attains its largest dimensions along the banks of the adjacent streams.

PHYSICAL PROPERTIES. — Wood very light, soft, not strong, of very fine grain, easily worked and yielding a satiny surface. It is of a light-brown color with abundant lighter sap-wood. *Specific Gravity*, 0.5575; *Percentage of Ash*, 0.63; *Relative Approximate Fuel Value*, 0.5540; *Weight of a Cubic Foot in Pounds*, 34.74.

USES. — The Macnab Cypress has been planted to a very limited extent for ornamental purposes in Europe and for this use it deserves far greater popularity than it now has, both in this country and abroad.

GENUS THUJA, LINNAEUS.†

Leaves persistent, small, opposite and of two sorts; those of young, seedling shoots being awl-shaped and spreading; the other are decussate, imbricated, adnate and closely appressed, rounded or keeled and sometimes, but not always, glandular on the back, compressed and forming a very flat branchlet. *Flowers* monœcious, appearing in very early spring, solitary, in very small oblong catkins, terminating the branchlets; staminate catkins oblong, subsessile and of from 4–6 decussately apposite anther-scales, which are peltate and bearing on their inner faces each 2–4 pendulous anther-cells opening downward, pollen grains simple; pistillate flowers of about the same size and terminating stronger

* *Zoe* V, p. 13.

† Also spelled *Thuya*.

main branchlets, and with from 8-12 erect scales fixed by the base and each bearing 2–4 bottle-shaped ovules. *Fruit*, cones small, ovoid-oblong, erect, pale brown with few (and in our species) thin, leathery, pointed oblong mucronate scales, spreading at maturity, the two or three middle pairs larger than the others and fertile, with generally two erect seeds at their bases; seeds in the American species light brown with broad lateral wings distinct at apex, axile embryo and fleshy albumen.

A genus of four species of trees, two of which are North American, one of the northeastern and one of the northwestern regions. (Name, from Greek, θύω, *I burn perfumes*, in allusion to the fragrance of the smoke of the burning wood.)

220. THUJA GIGANTEA, NUTT.*

GIANT CEDAR, NORTHWESTERN RED CEDAR, PACIFIC ARBOR VITÆ, SHINGLE-WOOD.

Ger., *Gigantische Zeder;* Fr., *Thuya gigantesque;* Sp., *Cedro giganteo.*

SPECIFIC CHARACTERS: — *Leaves* decussate, ovate, apiculate, adnate, about 1 in. long (longer on leading shoots) with free tips, obscurely glandular-pitted or eglandular, adnate and imbricated in four rows and forming a flat branchlet about ⅛ in. or a little less in width. *Flowers* about 1 line in length, dark brown, the fertile flowers less numerous and more confined to the extremities of the branchlets. *Fruit*, cones (mature in early autumn) generally clustered near the ends of the branchlets, about ½ in. long, strongly reflexed, with the leathery scales, which are furnished with stout mucros and each of the two or three central pairs of scales bears 2 or 3 seeds which are about ⅛ in. long and rather shorter than the wings.

(The specific name is the Latin for *gigantic*, appropriately applying to the stature of the tree.)

This tree, by far the stateliest representative of the genus, attains the height of 200 ft. (60 m.) with a confusion of short, horizontal and geotropic branches forming a narrow pyramidal head. Seeming quite out of proportion to the amount of its foliage is its massive trunk, sometimes 15 or 18 ft. (50 m.) in diameter at its strongly buttressed base and tapering gradually to its steeple-like summit. The bark of trunk is thin, of a reddish-brown color and fissured into long strips and fibrous ridges.

HABITAT. — This tree is distributed from southern Alaska southward along the coast to Mendocino, California, and eastward to the western slopes of the continental divide, thriving best on the low bottom-lands near the coast and attaining its largest size in western Washington and Oregon. Being scattered among other trees, it rarely forms exclusive tracts of forest.

PHYSICAL PROPERTIES. — Wood very light, soft, not strong, of rather coarse grain, splitting with facility, exceedingly durable in contact with the soil, easily worked, and yielding a smooth surface. It

* *Thuja plicata, Don.*

is of a rich reddish-brown color with nearly white sapwood. *Specific Gravity*, 0.3796; *Percentage of Ash*, 0.17; *Relative Approximate Fuel Value*, 0.3790; *Coefficient of Elasticity*, 103372; *Modulus of Rupture*, 749; *Resistance to Longitudinal Pressure*, 450; *Resistance to Indentation*, 70; *Weight of a Cubic Foot in Pounds*, 23.66.

USES. — A valuable wood for interior finishing, for doors, window-sashes, etc., for fences and general construction purposes; but the chief use to which it is applied is the manufacture of shingles, for which its wonderful durability gives it special value.

NOTE. — While in the State of Washington in December, 1899, I was told that there were at that time one hundred and fifty-eight shingle mills in that state in operation making shingles of this wood and turning out thousands of car-loads annually.

It is not entirely the standing timber which is being used in this industry, but largely the trunks of the fallen monarchs which may have lain many decades on the ground, indeed, some so long that large forest trees have grown above them.

I photographed one of these prostrate trunks on top of which a hemlock tree (*Tsuga heretophylla*) was growing with trunk 2 ft. in diameter and its great roots extended down on both sides of the cedar log. Then to determine the age of the hemlock, which had recently died as the result of forest fires, we cut into it and counted its annual rings. We found *one hundred and thirty*. No knowing how long the cedar may have lain there before the hemlock seed fell upon it and commenced germination. In all probability the cedar must have fallen about one hundred and fifty years ago and yet its trunk is in such sound condition that *most of it has recently been made into shingles.*

GENUS PINUS, TOURNEFORT.

Leaves evergreen, needle-shaped, from slender buds, in clusters of 2–5 together, each cluster invested at its base with a sheath of thin, membranous scales. *Flowers* appearing in spring, monœcious. *Sterile flowers* in catkins, clustered at the base of the shoots of the season; stamens numerous with very short filaments and a scale-like connective; anther cells, 2, opening lengthwise; pollen grains triple. *Fertile flowers* in conical or cylindrical spikes — cones — consisting of imbricated, carpellary scales, each in the axil of a persistent bract and bearing at its base within a pair of inverted ovules. *Fruit* maturing in the autumn of the second year, a cone formed of the imbricated carpellary scales, which are woody, often thickened or awned at the apex, persistent, when ripe dry and spreading each to liberate two nut-like and usually winged seeds; cotyledons 3–12, linear.

(*Pinus* is a Latin word from Celtic *pin* or *pen, a crag.*)

221. PINUS MONTICOLA, Dougl.

Mountain White Pine.

Ger., *Gebirgige weisze Fichte;* Fr., *Pin blanc de montagne;* Sp., *Pino blanco de los montes.*

Specific Characters: — *Leaves* in clusters of 5 each, vested at first in a sheath of scales, but which is soon deciduous, thick, rigid, glaucous, from 1½ to 4 in. long, serrulate, with rows of central and sometimes also dorsal stomata and containing a single fibro-vascular bundle and usually 2 dorsal resin ducts; branchlets rather stout, tough, and rusty pubescent the first season but finally glabrous. *Flowers* staminate oval, about ½ in. long and surrounded by eight involucal scales; anthers knobed or crested; pistillate flowers erect and in clusters at the tips of branchlets, oblong-cylindric, about ½ in. in length and with stout peduncles which bear long-pointed, conspicuously keeled scales persisting during the season. *Fruit* cones cylindrical, pointed and generally curved, from 5–11 in. long, light green and pendulous the second season, with stout incurved peduncles 1–1½ in. long; scales thin, from 1–1½ in. long by about ¾ in. in width, slightly thickened and smooth towards the small darker colored umbo at the apex. The cones, after having opened and liberated their seeds, in the autumn of the second season, fall during the following winter, the exposed portion of the scales being then light brown and the rest dark reddish brown; seeds about ¼ in. long, pale brown, somewhat pointed and furnished with a wing ¾ to 1 in. in length; cotyledons 6–9.

(The specific name, *monticola*, is from two Latin words, *mons, mountain*, and *colo, I dwell*, designating the tree as a *mountain dweller*.

The Mountain White Pine occasionally attains the height of 150 ft. (45 m.) with a straight columnar trunk 6 or 8 ft. (2 m.) in diameter, vested in a dark bark fissured lengthwise into firm, scaly ridges more or less broken by cross fissures.

Habitat. — From British Columbia southward to northern Montana and Idaho, where it is quite abundant, thence southward along the Cascade and coast ranges of Washington and Oregon and both slopes of the Sierra Nevada mountains, where it attains its greatest dimensions at an altitude of about 16,000 ft., and finds its southernmost point of distribution in Tulare Co., Cal.

Physical Properties. — Wood very light, soft, not strong, not durable in contact with the soil, with close grain, not very resinous, easily worked. It is of a light reddish or brownish buff color with lighter sap-wood. *Specific Gravity*, 0.3908; *Percentage of Ash*, 0.23; *Relative Approximate Fuel Value*, 0.3899; *Coefficient of Elasticity*, 95068; *Modulus of Rupture*, 609; *Resistance to Longitudinal Pressure*, 334; *Resistance to Indentation*, 67; *Weight of a Cubic Foot in Pounds*, 24.35.

Uses. — This tree yields a valuable lumber of superior working qualities, suitable for the various uses to which the eastern White Pine is applied, though not considered as valuable a timber as that of the eastern species.

222. PINUS ATTENUATA, LEMMON.

KNOB-CONE PINE, NARROW-CONE PINE.

Ger., *Fichte mit engen Zapfen;* Fr., *Pin de cones etroites;* Sp., *Pino de conos angostos.*

SPECIFIC CHARACTERS: — *Leaves* in clusters of three each, usually 3–5 in. in length, rather stout, rigid, stomatiferous on all sides, with sharp callous tips, serrate edges, and containing two fibro-vascular bundles and two to five parenchymatous resin ducts; each fascicle invested at its base with a close sheath, white and loose at margin, about $\frac{1}{2}$ in. in length at first but gradually shorter. *Flowers* staminate in elongated cylindrical orange-brown spikes, $\frac{1}{2}$–$\frac{3}{4}$ in. long and surrounded at base by six slightly fringed involucal bracts; pistillate in oblong spikes about $\frac{1}{2}$ in. in length in verticils of from 2–6 about the shoot of the year, and raised on short peduncles which are covered with brown fimbricated scarious bracts; the scales of the catkin terminate in long, slender points. Erect at first, these young cones gradually incline outwards and finally at maturity downwards. *Fruit,* cones, 3–6 in. long, $1\frac{1}{2}$–2 in. thick, of a pale brown color at first, elongated-conical, taper-pointed, very oblique and strongly reclined in whorls about the stem; the scales of the inner side being quite flat and armed with a weak incurved prickle, while those of the outer side are furnished with prominent transversely ridged knobs which are tipped with a wide-based incurved prickle. The cones are closed and adhere to the trunk and branches many years, finally becoming gray in color. The narrow tapering bases enables the newly forming wood to gradually encroach upon the cones and some finally become entirely enveloped by the wood The seeds are black, compressed, about 3 lines in length and furnished with lustrous light brown wings $\frac{3}{4}$–$1\frac{1}{4}$ in. long, widest above the middle.

(The specific name, *attenuata,* is the Latin for *made thin,* and refers to the narrow cones.)

The Knob-cone Pine is generally a small tree, occasionally attaining the height of 60 or 70 ft. (20 m.) and with a trunk 2 ft. (0.60 m.) in diameter, but generally not more than half the above dimensions and often fruiting when not more than four or five ft. in height. It has a rather narrow and irregularly pyramidal head of sparse foliage, the main branches being scattered and irregular and the main stem sometimes dividing near the summit into two or three perpendicular branches. The bark of old trunks is of a purple-brown color, weathering to grayish on the surface, and deeply fissured into thick, irregular plates and ridges which exfoliate in small friable scales.

Its most striking peculiarity is the great quantity of long and narrow cones which persist for many years in whorls about its branches and scattered along its trunk.

HABITAT. — Southwestern Oregon and southward along the western slopes of the Sierra Nevada mountains and the coast ranges to the San Bernardino mountains, only abundant in places and seeming to love the sun-baked slopes where few if any other trees can maintain an existence. It is most abundant and attains its largest size in the northern part of its range where it forms some tracts of open forest.

Physical Properties. — Wood rather soft and light, not strong, quite resinous and with conspicuous resin-ducts. It is of a light yellowish-brown color, often tinted with red and abundant lighter sap-wood. *Specific Gravity*, 0.3499; *Percentage of Ash*, 0.33; *Relative Approximate Fuel Value*, 0.3487; *Coefficient of Elasticity*, 42870; *Modulus of Rupture*, 409; *Resistance to Longitudinal Pressure*, 263; *Resistance to Indentation*, 86; *Weight of a Cubic Foot in Pounds*, 21.81.

Uses. — Amid the wealth of better woods of the Pacific slope little use is made of this inferior timber save for fuel.

Medicinal Properties are doubtless only those common to the genus and noted of the *P. palustris*, Part V, p. 52.

Note. — In considering this tree we cannot refrain from wondering what may be Nature's plan in keeping its seeds sealed so long, often for a half century or more in its closed cones. Many of them are not liberated during the lifetime of the tree, and when the cones become wholly enveloped by the wood of the trunk it is not until the decay of the trunk even that they are finally liberated, and, strangely, after this long period of concealment they have been found to be fertile, whereas the seeds of the deciduous-cone pines scarcely retain their fertility it is said for more than two years.

Many of the seeds of this species never have an opportunity to germinate on account of the larvæ of insects which infest the cones and eat them. These grubs in the cones are dainty morsels for the wood-peckers and hence it is that many of the cones have large holes drilled into them by these hard-working birds.

Genus TSUGA, Carrière.

Leaves petiolate and articulated on permanent bases, flat in most species, appearing two-ranked, whitened-beneath, with a single dorsal resin-duct, evergreen. *Flowers* in early summer, monœcious; the sterile sub-globose clusters of stamens from the axils of the leaves of the previous year, the stipes surrounded by numerous bud-scales; anthers tipped with a short spur or knob and cells opening transversely by a continuous slit; fertile aments terminal on the branchlets of the previous year, erect, bracts somewhat shorter than the scales. *Fruit*, pendulous cones maturing the first year; scales thin and persistent on the axis; bracts short, inclosed; seeds with resin vesicles on the surface and wing finally breaking off; cotyledons three–five or six.

Genus consists of trees of few species with slender and often drooping terminal branchlets. *Tsuga* is the Japanese name of one of the representatives of the genus.

223. TSUGA HETEROPHYLLA, SARG.*

WESTERN HEMLOCK.

Ger., *Westliche Tanne;* Fr., *Peruche occidental;* Sp., *Abeto occidental.*

SPECIFIC CHARACTERS : — *Leaves*, linear, flat, from $\frac{1}{4}$–$\frac{3}{4}$ in. long, rather less than a line in width, rounded at apex, abruptly tapering at the base to a slender petiole, entire or spinulose-serrulate towards the tip, grooved and lustrous dark green above and with white bands of stomata beneath; branchlets pale brown, very slender and rough with the persistent bases of the petioles; leaf-buds small, about $\frac{1}{16}$ in. long, bright brown, puberulous. *Flowers* staminate yellow, about $\frac{1}{8}$ in. in length and rather shorter than the slender stipe, pollen grains discoidal; pistillate flowers purple, about $\frac{1}{4}$ in. long and terminating the small branchlets. *Fruit* cones sessile, oblong-cylindrical when closed, $\frac{3}{4}$–1 in. in length and with thin scales slightly puberulous outside and light reddish brown at maturity; branchlets small, rounded or acute at apex, dark purple, puberulous; seeds about $\frac{1}{8}$ in. long, with narrow wing two or three times as long and occasional oil vesicles; cotyledons $\frac{5}{8}$.

The Western Hemlock is the largest representative of its genus, sometimes attaining the height of 200 ft. (60 m.), and a diameter of trunk of 8 or 10 ft. (3 m.). It forms a rather narrow pyramidal top of gracefully sweeping branches and slender drooping branchlets. The bark is very similar to that of the eastern species, being on old trunks of a chocolate-brown color, deeply fissured into prominent longitudinal and obliquely connecting ridges and exfoliating in thickish irregular scales.

HABITAT. — From southeastern Alaska, where it surpasses all other forest trees in size, southward nearly to San Francisco and eastward to the western slopes of the continental divide. It is most abundant and luxurious in the humid region along the coast from sea-level up to an altitude of about 2,000 ft., being most abundant in western Washington, Oregon and British Columbia. Farther inland it ascends to an altitude of 6-8,000 ft. on favorable slopes.

PHYSICAL PROPERTIES. — Wood light, rather hard and tough, close-grained, susceptible of a good polish, of a pale, yellowish-brown color with lighter sap-wood. *Specific Gravity*, 0.5182; *Percentage of Ash*, 0.42; *Relative Approximate Fuel Value*, 0.5160; *Coefficient of Elasticity*, 137483; *Modulus of Rupture*, 909; *Resistance to Longitudinal Pressure*, 547; *Resistance to Indentation*, 101; *Weight of a Cubic Foot in Pounds*, 32.39.

USES. — Lumber made from this tree is more easily worked, stronger and more durable than that furnished by our eastern Hemlock, and it is used to considerable extent in house-building and for general con-

* *Tsuga mertensiana*, authors, not Carr.

struction purposes, though its merits do not seem to be generally appreciated — probably on account of the poor reputation of its eastern relative. It will doubtless come into far greater prominence as the supply of firs and redwoods becomes more reduced. It furnishes a very good pulp for paper-making and its bark, which is richer in tannin than that of the eastern species, is considered the best bark for tanning purposes produced in the forests of Oregon, Washington and British Columbia. The inner bark of this tree possesses nutritive value.*

GENUS ABIES, LINK.

Leaves sessile, short, solitary, usually more or less flattened and entire, with circular and not prominent bases, often emarginate, more or less two-ranked especially on the horizontal branches and young trees by a twist near the base, bearing stomata usually only below, with two resin ducts; branchlets smooth, bearing the more or less circular not prominent leaf scars. *Flowers* from the axils of last year's leaves; the staminate borne in abundance along the under side of the branchlets, oblong or cylindrical, with short stipes surrounded by numerous bud-scales; anther-cells two, extrorse, opening transversly, the connective terminating in a knob; pollen grains large with two air sacs; pistillate flowers erect, with bracts larger than the scales; ovules two, adnate to the inner side of each scale near the base. *Cones* erect upon the upper branches and maturing the first year, sessile, nearly cylindrical, with numerous spirally arranged, imbricated, carpellary scales, each in the axil of a thin membranous bract which with the scale falls away at maturity from the persistent axis; seed covered with resin-vesicles and each bearing a membranous wing, the base of which covers the outer and laps over upon the inner surface; cotyledons 4 to 10.

Trees of about sixteen or eighteen species, generally of remarkable pyramidal growth, confined to the northern hemisphere of both continents and represented in the United States by nine species mostly on the Pacific Slope. (*Abies* is the ancient Latin name of the Fir.)

224. ABIES GRANDIS, LINDL.

GREAT SILVER FIR.

Ger., *Grosze Tanne;* Fr., *Sapin grand;* Sp., *Abeto grande.*

SPECIFIC CHARACTERS: — *Leaves* lustrous dark green, with deep central groove above, and two silvery white stomatose bands beneath, rather thin and flexible, those of the sterile branches ½ in. long and about ⅛ in. broad, widely two-ranked, conspicuously emarginate at apex; leaves of the cone-bearing branchlets more crowded, somewhat shorter, rather erect on the upper side of the branchlet than two-ranked, and notched or bluntly pointed at apex; those on young shoots acute at apex; winter buds globose, ¼ in. or less in length and copiously resin-coated; branchlets rather slender and puberulous the first season. *Flowers* staminate oblong, ½–¾ in. in length with pale yellow anthers; pistillate cylindrical, slender, ¾–1 in. long and ¼ in. thick, with light yellowish green scales having reflexed tips. *Fruit*, cones, cylindrical, from 2-4 in. long and 1-1¼ in. thick, rounded and often retuse at apex with bright green and puberulous scales averaging about 1 in. in width and two-thirds as wide, abruptly narrowing from the broad apex; bracts included, scarcely half as long as the scale, obcordate, laciniate and generally with a short mucro; seeds ⅜ in. long, brown, with pale brown wings ½–⅝ in. long, and nearly as broad near the rounded end.

The specific name, *grandis*, the Latin for *great*, is descriptive of the grand stature of the tree.

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* For an interesting account of this curious food and the process of preparation see Sargent's *Silva* XI. p. 93. *Note.*

This beautiful and stately tree sometimes attains the height of 300 ft. (90 m.) with short and sometimes pendulous branches forming a narrow irregular pyramidal head. It has a straight, columnar trunk, from 4 to 6 ft. (1.50 m.) in diameter, vested in a dark-brown bark, fissured lengthwise into quite regular, firm ridges which break away in thick, irregular fragments. The bark of younger trunks is much thinner, of a pale-gray color and bearing numerous resin-blisters.

HABITAT. — From British Columbia southward to Mendocino Co., Cal., and eastward to the western slopes of the continental divide in Montana, but in southern Oregon and northern California not extending many miles inland from the coast. It attains its greatest dimensions in the alluvial bottom-lands near the coast, but is found along streams and on moist slopes to an altitude of from 5,000 to 7,000 ft., never anywhere forming exclusive forests but scattered among the Giant Cedars, Douglas and Tideland Spruces, Redwoods and other trees of its range.

PHYSICAL PROPERTIES. — Wood very light, soft, not strong or durable, coarse grain, easily worked and yielding a very smooth, satiny surface. It is of a very light, yellowish-brown color, with lighter sap-wood. *Specific Gravity*, 0.3545; *Percentage of Ash*, 0.49; *Relative Approximate Fuel Value*, 0.3528; *Coefficient of Elasticity*, 95838; *Modulus of Rupture*, 494; *Resistance to Longitudinal Pressure*, 391; *Resistance to Indentation*: 51; *Weight of a Cubic Foot in Pounds*, 22.09.

USES. — The wood of this tree is occasionally manufactured into lumber for interior finishing, boxes, casks, etc., but hitherto has been little valued as compared with the Douglas Spruce, Giant Cedar, etc., which grow in abundance with it.

MEDICINAL PROPERTIES so far as known, are only those of the balsam which may be gathered from the blisters in the bark of the younger trunks.

225. ABIES NOBILIS, LINDL.

NOBLE FIR, OREGON "LARCH."

Ger., *Erlauchte Tanne;* Fr., *Sapin noble;* Sp., *Abeto noble.*

SPECIFIC CHARACTERS: — *Leaves* glaucous blue-green, on the fertile upper branches thick, incurved, erect, nearly equally 4-sided and crowded upon the upper side of the branchlets, those of the under side by a twist and curve at their bases, with a distinct central groove above, keeled beneath, stomatiferous both sides, with fibrovascular bundle central and resin ducts close to the epidermis of the lower side, the leaves of the sterile branches flattish, slightly notched at apex, from 1–1½ in. long, less crowded than those of the fertile branchlets; winter buds about ⅛ in. long, with acute reddish brown scales, and thickly resin-coated;

branchlets rather slender, puberulous. *Flowers* staminate cylindrical, ¾–1 in. long, sessile at first, but finally suspended on slender pedicels about ⅛ in. long; pistillate flowers cylindrical, erect upon the branchlets, 1–1½ in. long and about ¼ in. thick, with scales much smaller than their bracts which are reflexed, and with long slender tips. *Fruit* cones cylindrical-oblong, from 6–8 in. long and 2–3 in. thick, rounded at apex and almost covered by the large, much exserted and strongly reflexed pale green bracts which are spatulate with fimbriated margin and broad midrib extended into a long point; scales somewhat broader than long, rounded at apex; seeds about ⅛ in. in length, slender and furnished with a cuneate tri-angular wing about ½ in. in length.

(The specific name, *nobilis*, Latin for *noble*, is given in apt allusion to the noble stature of this majestic fir.)

The Noble Fir, under favorable conditions, attains the height of 250 or 275 ft. (80 m.), with comparatively short branches and massive columnar trunk 6 or 8 ft. (2 m.) in diameter, clothed with a reddish-brown bark, fissured lengthwise into flat, scaly ridges. The young trees, under 75 or 100 ft. in height, have a habit of quite regular pyramidal growth with branches longest at the ground and successively shorter to the pointed summit.

HABITAT. — The Cascade and Coast ranges from northern Washington southward to the valley of the McKinzie River in Oregon, very abundant and attaining its largest size in northwestern Oregon between the altitudes of 2,000 and 5,000 ft., there being in places the principal forest tree.

PHYSICAL PROPERTIES. — The Noble Fir wood is light, strong, rather hard, of close grain, and of a very light yellow-brown color with lighter sap-wood. *Specific Gravity*, 0.4561; *Percentage of Ash*, 0.34; *Relative Approximate Fuel Value*, 0.4545; *Coefficient of Elasticity*, 127660; *Modulus of Rupture*, 862; *Resistance to Longitudinal Pressure*, 453; *Resistance to Indentation*, 120; *Weight of a Cubic Foot in Pounds*, 28.42.

USES. — Quite extensively used in the manufacture of lumber for interior finishing, ceilings, boxes, etc., for which it is excellent. It is a tree of marked value for ornamental purposes, and is being successfully and quite extensively planted in Europe. It is not as well adapted to the climate of our eastern states, though it is occasionally grown.

NOTE. — Those unfamiliar with the magnificent stately firs of the Pacific slope, as we see them in their native forests, may be interested in knowing the dimensions of the particular tree from which our wood-sections were taken, and what became of the rest of the tree. It grew on the lumber tract of the Bridal Veil Lumber Co., located at Bridal Veil, Oregon, and for convenience and economy of operations this company has few equals.

Our tree was not by any means one of the largest of its kind, but it was considered by the lumbermen as a "fair" tree. Its extreme height was 254 ft.; lowest branches, 176 ft from the ground; diameter of trunk, 4 ft. from the ground, 63 in. This trunk was as clear and shapely as a mast, and from it eight logs sixteen feet long and one thirty-two feet long were cut. The upper end of the top-most log (160 ft. from the ground) was 35 in. in diameter, and just above this the material for our wood-sections was taken.

A powerful "donkey" engine hauled the logs through the forest, with such power that a road for them was unnecessary, until they were deposited at the head of a trough-like chute. They were then rolled into it and down it they slid with awful momentum and plunge into a pond below. Here they were denuded of bark on one side, floated to the logging railroad which terminated on the bank of the pond, and were "dogged" together end to end. A locomotive was then coupled to them — a chain of logs — to drag them to the saw-mill some miles below. They were promptly hauled out of the water and along over the ties at the rate of ten or twelve miles per hour, the rails of the road keeping them from leaving the track, to the saw-mill. There the nine logs were sawn into just 18,142 ft. of magnificent clear lumber, and the boards were floated in a flume to the planing mills and kilns at the railroad station in the valley below. After treatment there the lumber, in the form of the nicest kiln-dried planed and matched ceiling, was loaded onto the cars and shipped to market.*

*This record was kindly kept and furnished to me by Mr. Harry L. Bradley of the Bridal Veil Lumber Co., whose courtesy and kindness I hereby gratefully acknowledge.

INDEX.

TREE STUDIES.

SERIES A:—TREES AND THEIR BARKS.
SERIES B:—LEAVES, FLOWERS, FRUITS AND BUDS.

BY
ROMEYN B. HOUGH, B. A.

ANNOUNCEMENT.

As it has been made the writer's individual duty to gather the woods for the specimens used in the publication of "AMERICAN WOODS," in order that he may be able to vouch for their authenticity, an unusual opportunity is presented him for the observation of our various trees in their native homes. He visits them for the purpose of their acquaintance, and carries with him a camera that he may secure pictures of such individuals as best show specific character in habit of growth, nature of bark, etc. — for trees indicate identity in these respects far more than the casual observer suspects, and it becomes a fascinating study to observe them.

The result is the acquisition of a series of pictures of rare value in the study of tree life. They are of such interest that plans have been made for their publication in the form of artistic photogravures, which represent the original photographs the most perfectly of any process known to the art of printing.

The size of the photogravures is about 7 by 9 inches. They are mounted on dark gray — "maltese" — mats about 10 by 13 inches in size and fully labeled with all necessary data. These plates will be issued in sets or Parts of twenty-five each and in two forms, viz: as bound quarto volumes and as neatly encased portfolios, the plates in the latter being separable, for the greater convenience of comparison and classification. The intention is to cover the native and naturalized trees of the United States in the series, as is the case with AMERICAN WOODS, and a large number of the negatives required for the work are already in hand. Their publication will be commenced as soon as the subscriptions received justify the final expense of issuing, and the work will then be pushed as rapidly as possible to completion. Parties interested are respectfully requested to fill in and return the

accompanying order blank and the work will be supplied to them serially as promptly as issued.

Tree Studies will be brought out in two series as follows:

SERIES A:—TREES AND THEIR BARKS.

The trees selected for these pictures are as far as possible isolated individuals, which, having had abundant light on all sides, have therefore had free opportunity of growth according to innate tendency. Care is taken to select such trees as are fully mature and yet not old enough to have become decrepit by the loss of branches or otherwise. Such trees show a more or less regular and characteristic symmetry of contour, ramification of branches, etc., which features are well brought out in these pictures.

To convey an idea as to size care is taken to have an object of comparatively known size appear in the field — generally a man, but sometimes lounging cattle or other objects serve the purpose. The deciduous trees are gererally represented each by two pictures, one showing it in leaf and the other without leaves. The evergreen trees are generally shown each by a single picture, but sometimes by two, one showing a forest-grown tree and the other a tree growing in the open.

While these pictures portray the tree as plainly the main object, they also show something of its natural surroundings, and rare bits of scenery are sometimes shown in the background. When these settings are of importance they are mentioned in the labeling; thus adding not a little of geographic interest to the pictures.

The bark pictures are made with the camera placed near the trunk of the tree so as to show detail as well as possible, and for a standard of measurement a one-foot rule is fastened upon the trunk.

Each plate is made up of the one or two pictures of the tree, as the case may be, and the view of the bark. It is fully labeled with technical and common names, mention of the locality where the tree was photographed, objects of importance in the scene and such other data as may be of interest.

SERIES B:—LEAVES, FLOWERS, FRUITS AND BUDS.

In these pictures we have, after a great deal of study and experiment, quite surpassed our fondest expectations, and they have elicted the strongest expressions of approval from their critics. Such detail, as of nature of surface, etc., is shown that a magnifier is often found of service in examining them, quite as though we were examining the real objects, and specific distinctions are just as perfectly observable in them. They are made from freshly gathered specimens, even

before their wilting, and the entire collection represents the subjects as we see them in nature far better than do pressed herbarium specimens.

A unique and original standard of comparison is made use of in these pictures, which enables one to tell at a glance the size of the object, however much it may be enlarged or reduced in the picture. This is essential for the greatest educative value of the picture, as objects of all sizes are brought together into plates of uniform size, but the natural size of the object is at once apparent by the background, which serves as a uniform standard of measurement.

In showing the flowers an entire flower cluster is represented *in situ* upon the branchlet, and the same is true of the fruit, parts of both being shown enlarged when necessary to bring out characters of specific distinction. The leaves are shown attached to the brachlets in both of the above pictures if to be found at the seasons when they are made, the more unusual forms being shown by detached specimens, or by an additional negative in case of such leaves as do not attain full growth until after the maturity of the fruit. The winter buds, by which we are able to distinguish most of our trees in winter, are shown on branchlets, generally of the entire previous season's growth, by a separate negative.

Prints from all the above negatives pertaining to a species are gathered together in the make-up of a single plate, which is labeled with technical and common names, the season of blossoming and maturing of fruit, and such other data as may be of importance.

With the aid of these plates the positive identification of our various trees is made a very easy matter, even for a bright school child, without the use of botanical descriptions.

THE PRICE OF "TREE STUDIES" IS AS FOLLOWS.

In Cloth Binding, - - - - - - - - $3.00 per Part.
In Half Morocco Binding, - - - - - $5.00 per Part.

It is the same whether bound in volumes or in portfolios.

When both Series A and B are ordered a discount of 10% is allowed on both.

We are prepared to furnish stereopticon views of any of the subjects of our plates at 50 cents each, or in quantities of twenty-five or more at 40 cents each. Prices of contract-print photographs, transparencies and enlargements — especially appropriate for school-room display — quoted on request with statement of the size desired.

Address, ROMEYN B. HOUGH,

LOWVILLE, N. Y.

201. CEANOTHUS SPINOSUS, Nutt.

Redwood Myrtle, Spiny Myrtle.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Dornige Myrte. *Fr.* Myrte espineuse.

Sp. Myrto espinosa.

Published and Sections made by Romeyn B. Hough, B. A., Lowville, N. Y., U. S. A.

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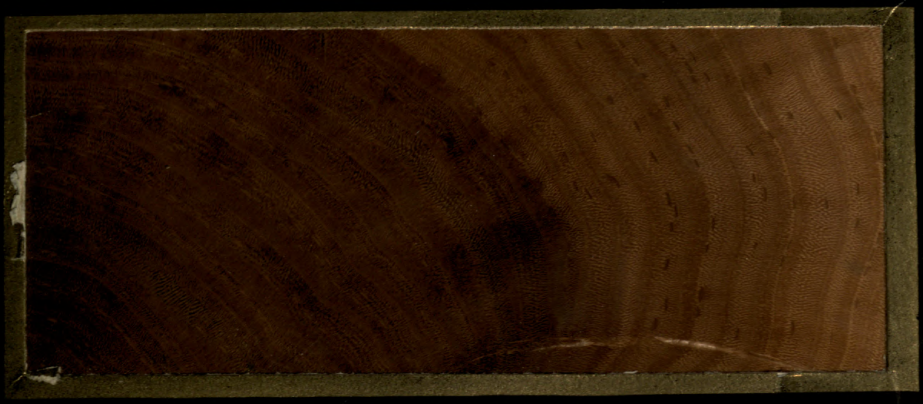
202. CEANOTHUS SOREDIATUS. H.& A.

Southern Blueblossom, Green Thorn.



TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Süder Flieder, *Fr.* Lilas meridional.

Sp. Lilac meridional.

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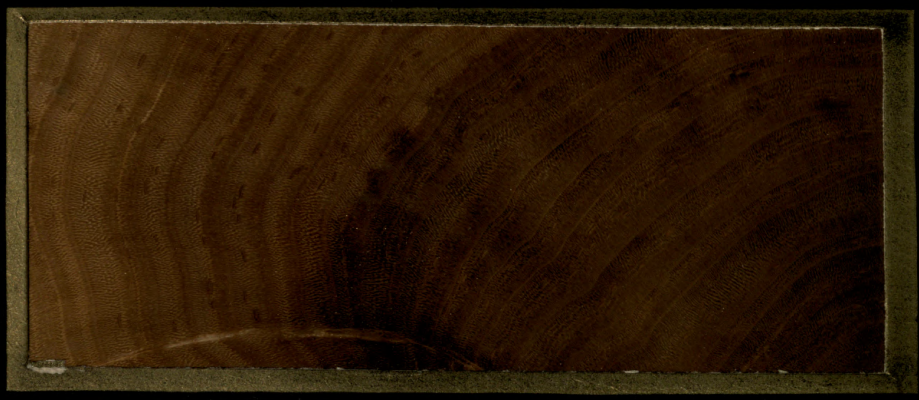

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RADIAL SECTION.

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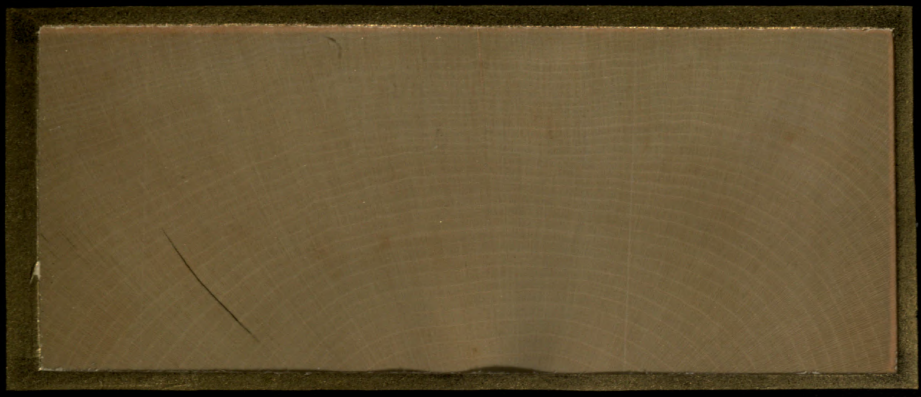
Ger. Süder Flieder, *Fr.* Lilas meridional.

Sp. Lilac meridional.

203. ACER CIRCINATUM, Pursh.

Vine Maple.



TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Rebenahorn. *Fr.* Erable de vigne.

Sp. Arce de vid.

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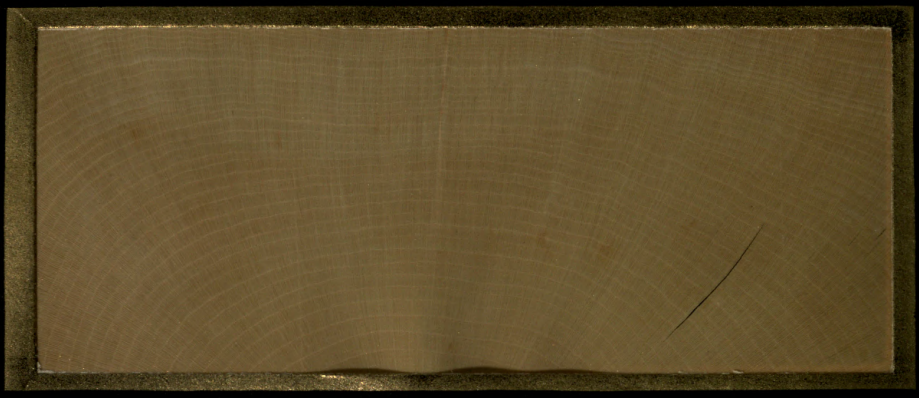

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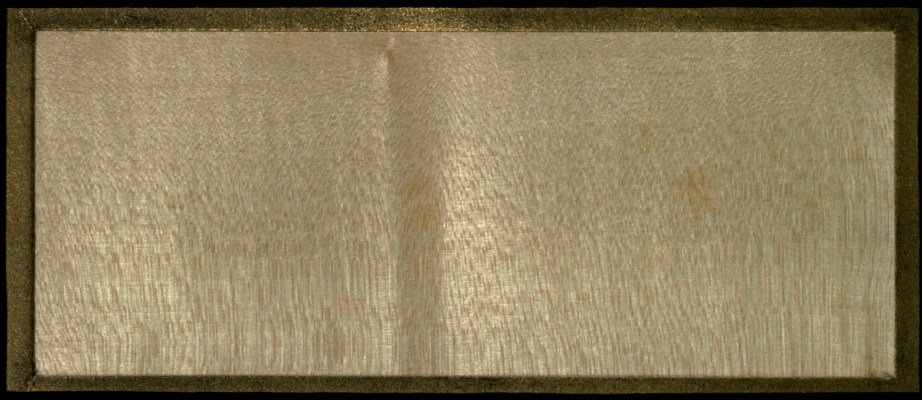

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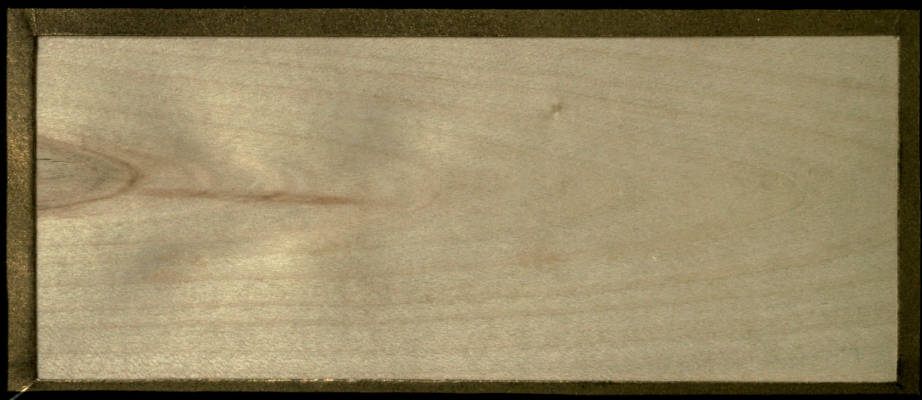

TANGENTIAL SECTION.

Ger. Rebenahorn. *Fr.* Erable de vigne.

Sp. Arce de vid.

204. PARKINSONIA MICROPHYLLA, Torr.

Mountain Palo Verde, Small-leaf Horse Bean.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Gebirgspaloverde. *Fr.* Palo Verde de montagne.

Sp. Palo Verde de montaña.

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RADIAL SECTION.

TANGENTIAL SECTION.

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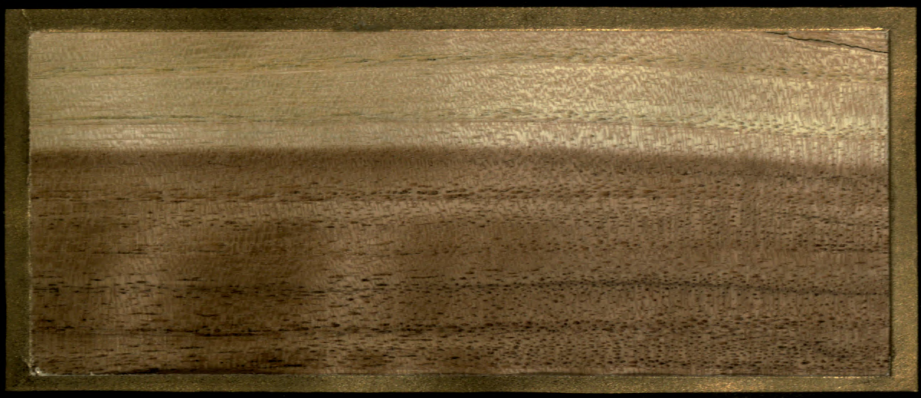
Sp. Palo Verde de montaña.

205. PROSOPIS ODORATA, Torr.& Frem.

Screwbean, Screw-pod Mesquite.

TRANSVERSE SECTION.



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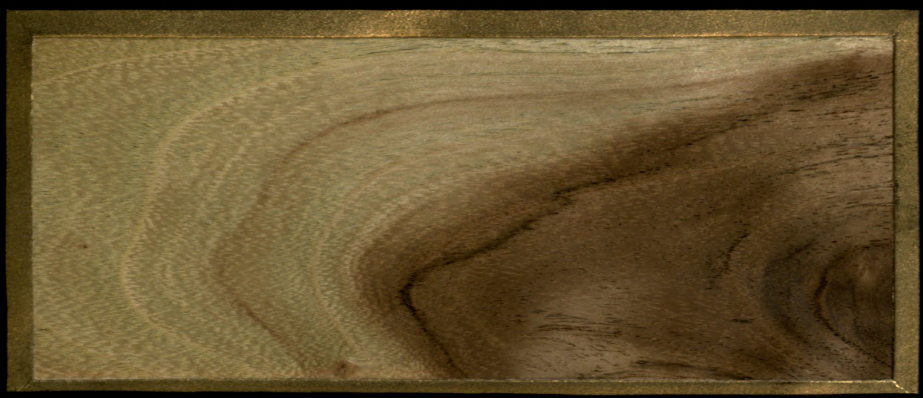

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Ger. Schraubenhülse. *Fr.* Cosse de vis.

Sp. Tornillo.

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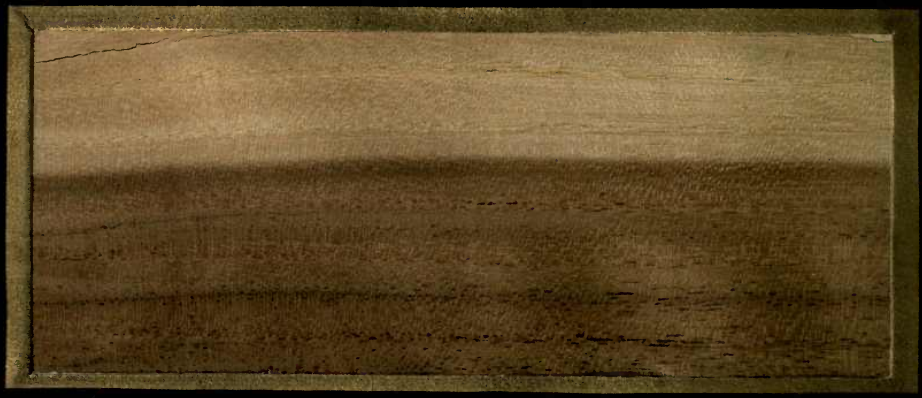

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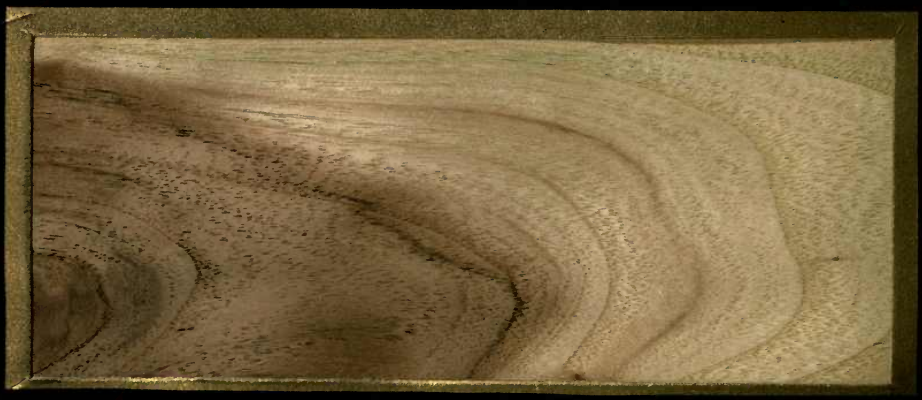

TANGENTIAL SECTION.

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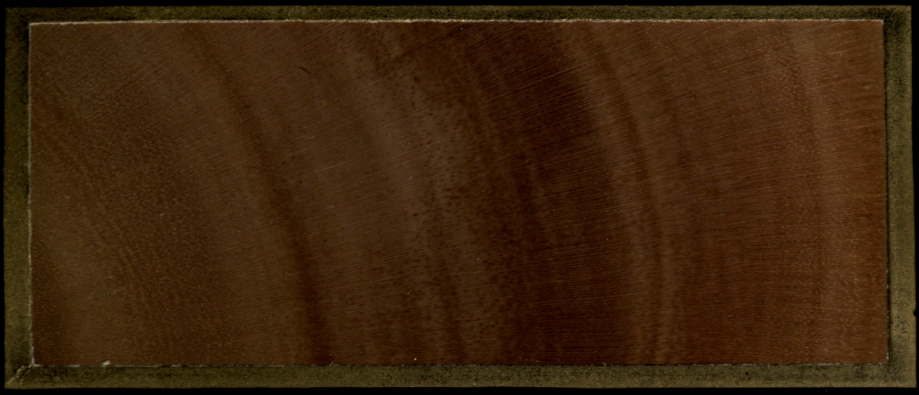
Sp. Tornillo.

206. ACACIA DECURRENS, Willd.

Green Wattle, Black Wattle.



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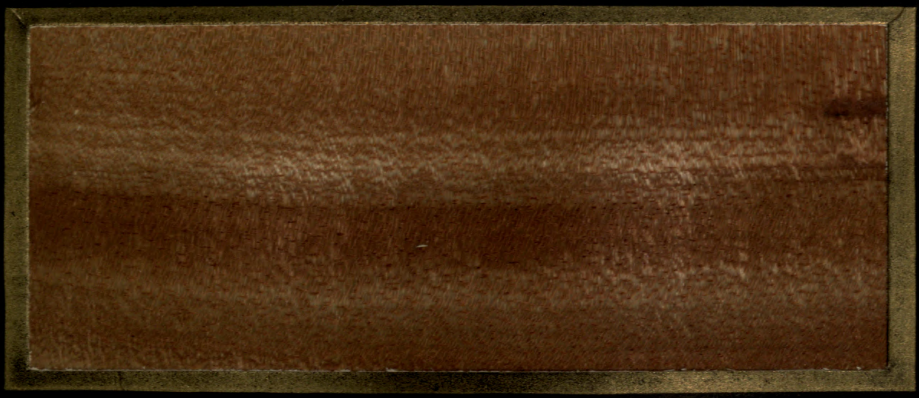

RADIAL SECTION.

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Ger. Grüne Hürde. *Fr.* Claie verte.

Sp. Zarzo verde.

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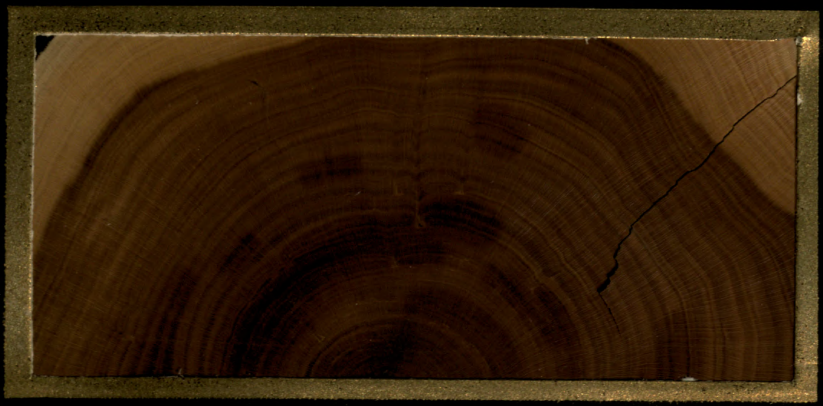
207. PRUNUS SUBCORDATA, Benth.

Pacific Plum, Wild Plum.



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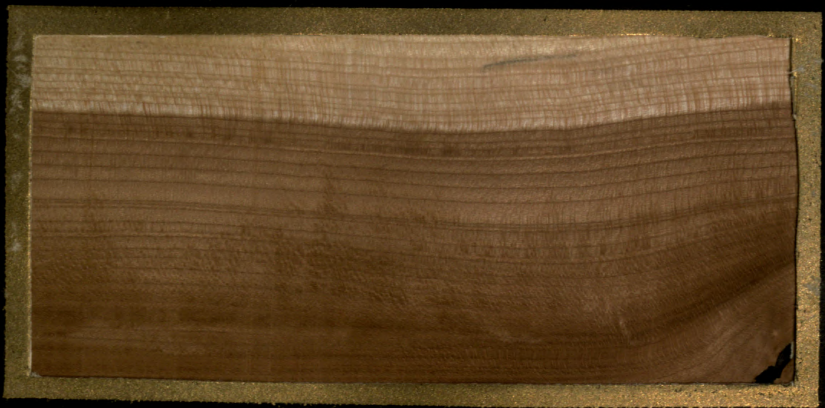

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Californische Pflaume. *Fr.* Prune de Californie.

Sp. Ciruelo silvestre de California.

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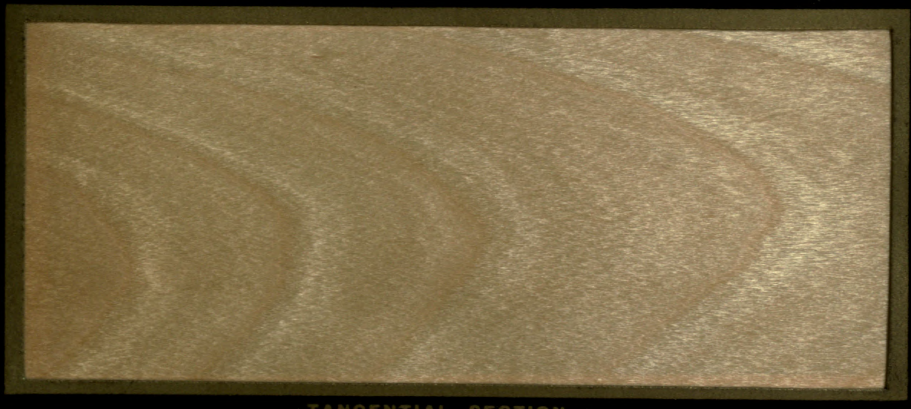
203. PRUNUS MOLLIS Walp.

Woolly-leaf Cherry, Bitter Cherry.

TRANSVERSE SECTION.

RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Haarigblättrige Kirsche. *Fr.* Cerisier à feuilles velues.

Sp. Cerezo de hojas pelosas.

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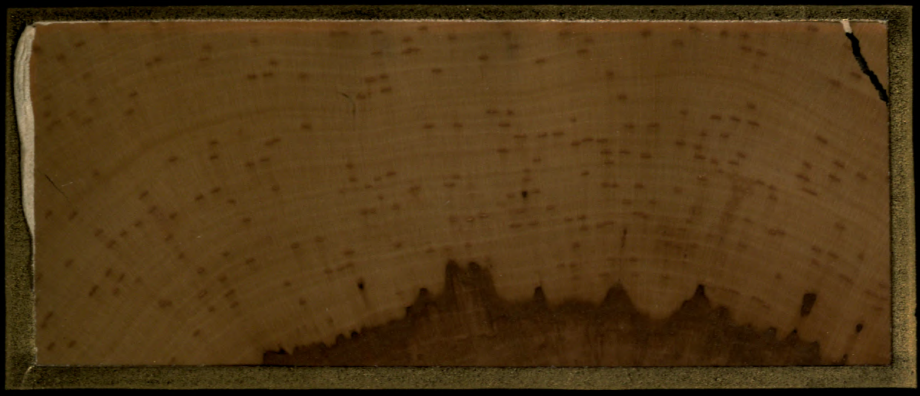
209. PYRUS RIVULARIS, Dougl.

Oregon Crab or Crab Apple.



TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Oregonischer Holzapfel. *Fr.* Pommier sauvage d'Oregon.

Sp. Manzano silvestre de Oregon.

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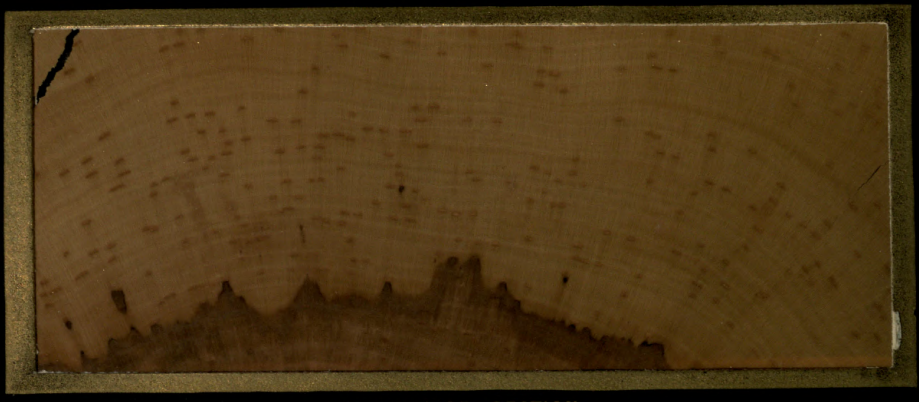
Oregon Crab or Crab Apple.



TRANSVERSE SECTION.

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TANGENTIAL SECTION.

Ger. Oregonischer Holzapfel. *Fr.* Pommier sauvage d'Oregon.

Sp. Manzano silvestre de Oregon.

210. CRATAEGUS DOUGLASII, Lindl.

Black Thorn, Western Haw, Black Haw.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Schwarze Hagedorn. *Fr.* Aubepine noire.

Sp. Espino negro.

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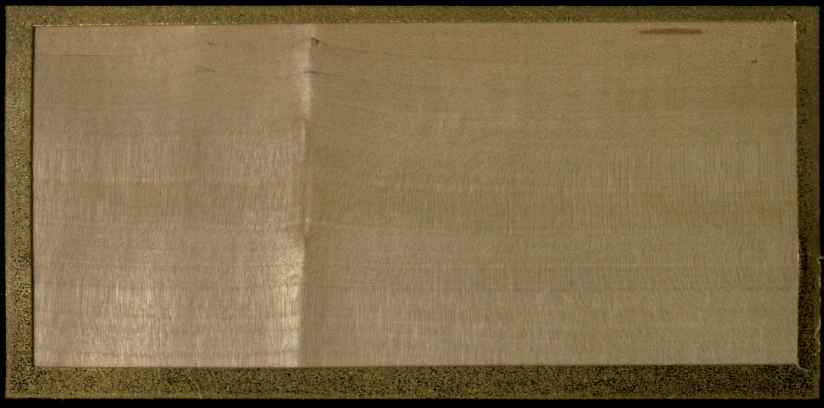


RADIAL SECTION.

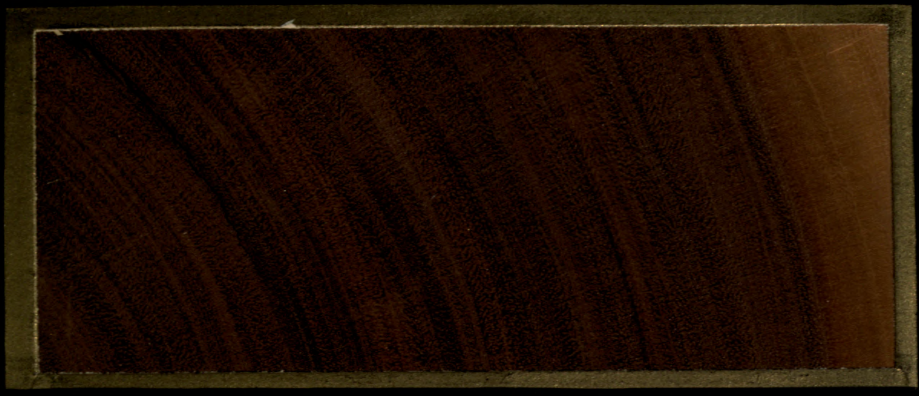
TANGENTIAL SECTION.

Ger. Schwarze Hagedorn. *Fr.* Aubepine noire.

Sp. Espino negro.

211. EUCALYPTUS ROSTRATA, Schlecht.

Red Gum, Biall.



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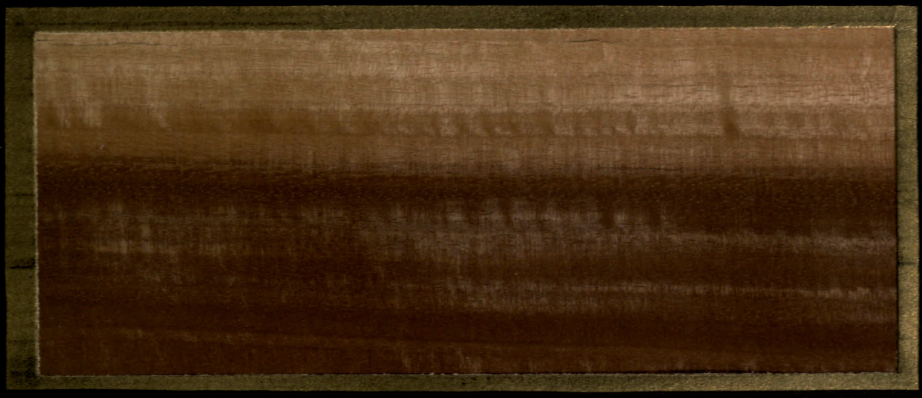

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Rothgummi. *Fr.* Gommier rouge.

Sp. Goma colorada.

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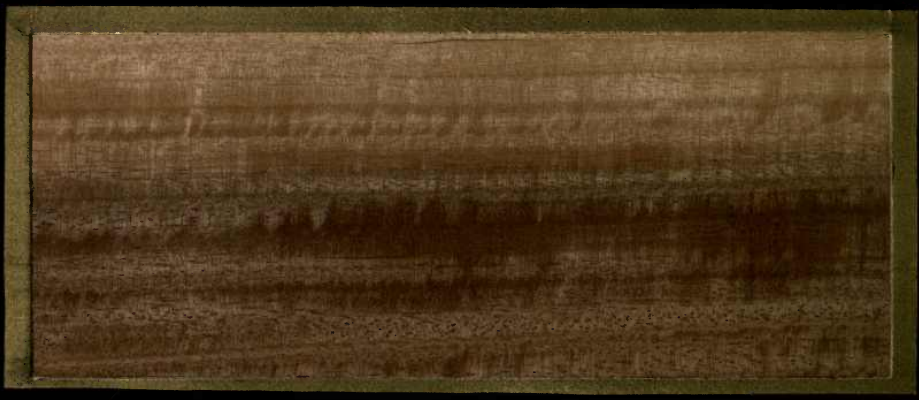
Red Gum, Biall.

TRANSVERSE SECTION.



RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Rothgummi. *Fr.* Gommier rouge.

Sp. Goma colorada.

212. FRAXINUS VELUTINA, Torr.

Leather-leaf Ash.

TRANSVERSE SECTION.

RADIAL SECTION.

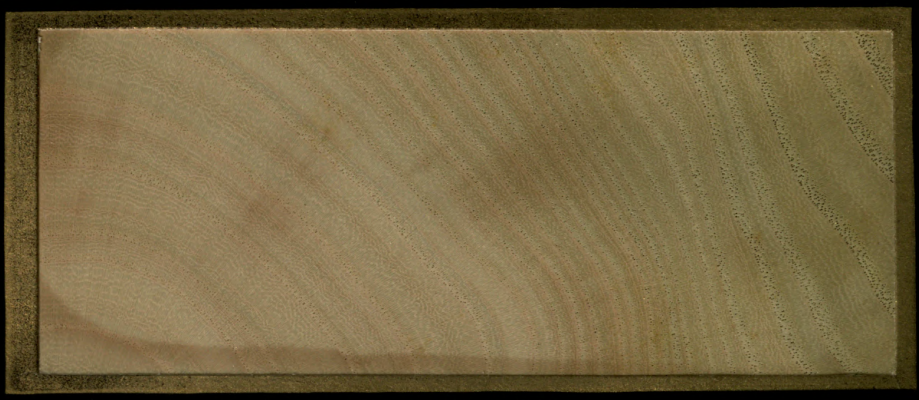
TANGENTIAL SECTION.

Ger. Lederblättrige Esche. *Fr.* Frêne à feuilles de cuir.

Sp. Fresno des hojas de cuero.

212. FRAXINUS VELUTINA, Torr.

Leather-leaf Ash.



TRANSVERSE SECTION.

RADIAL SECTION.

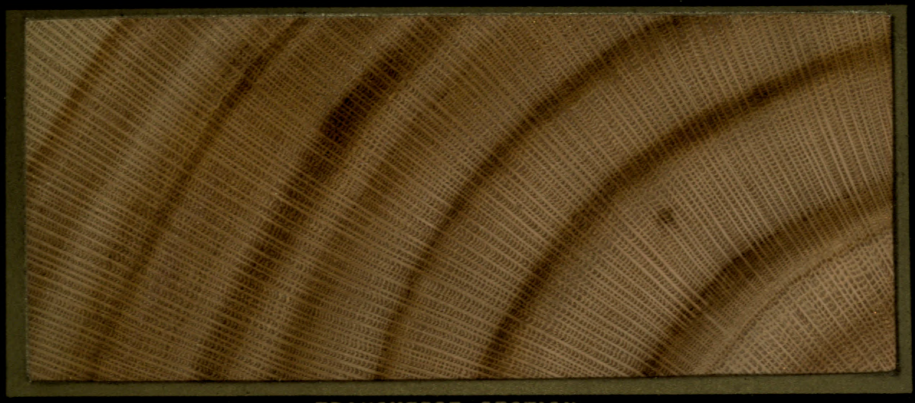
TANGENTIAL SECTION.

Ger. Lederblättrige Esche. *Fr.* Frêne à feuilles de cuir.

Sp. Fresno des hojas de cuero.

218. GREVILLEA ROBUSTA Cunn.

Silky Oak, Grevillea.



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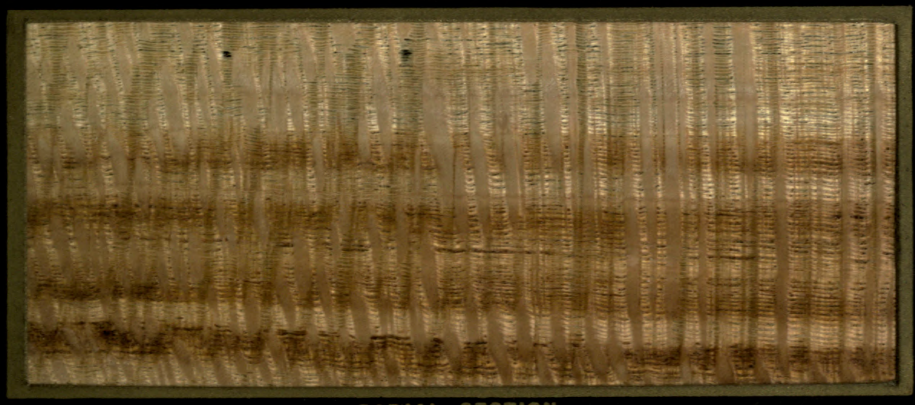


RADIAL SECTION.

TANGENTIAL SECTION.

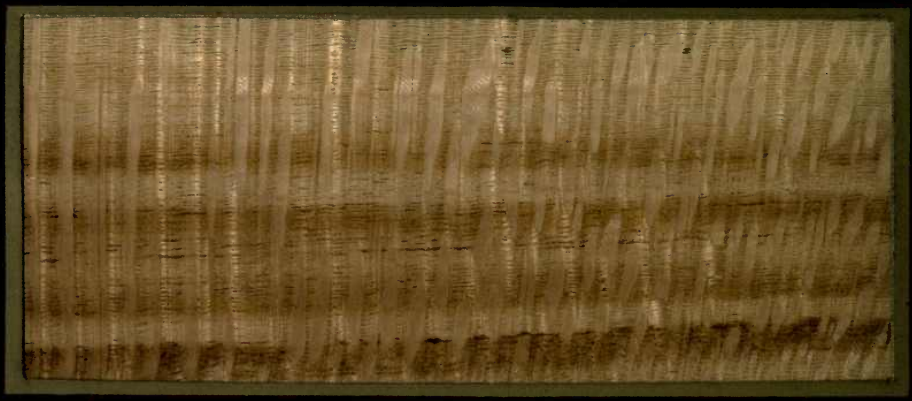
Ger. Starke Grevillea. *Fr.* Grevillea robuste.

Sp. Grevillea robusta.

213. GREVILLEA ROBUSTA. Cunn.

Silky Oak. Grevillea.

TRANSVERSE SECTION.



RADIAL SECTION.

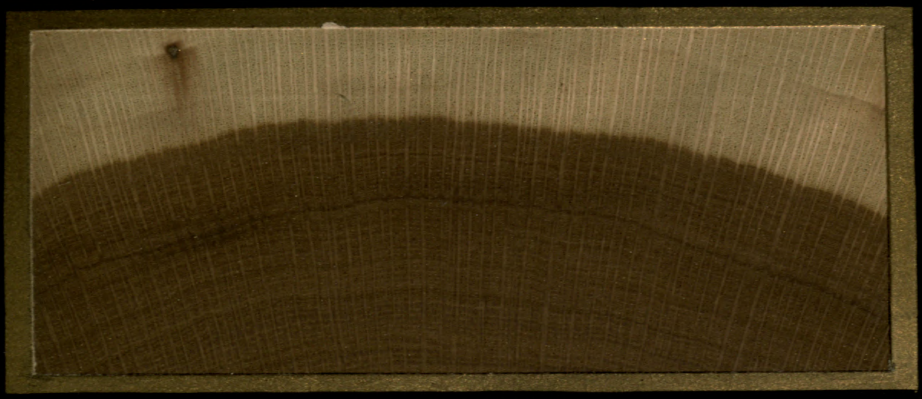
TANGENTIAL SECTION.

Ger. Starke Grevillea. *Fr.* Grevillea robu...

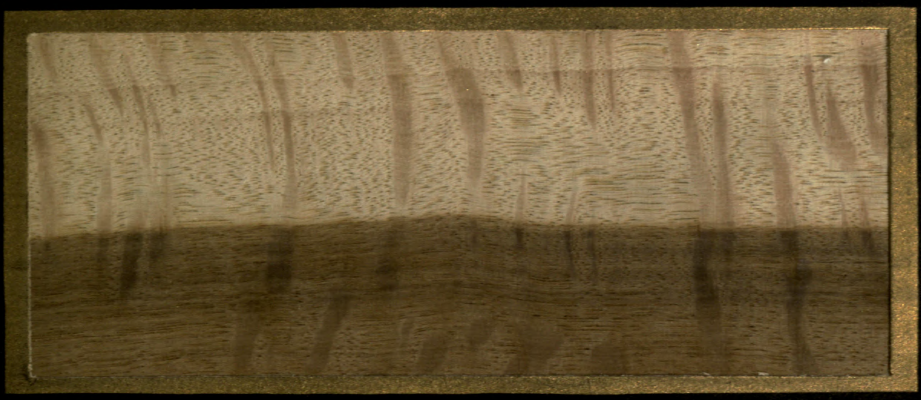
Sp. Grevillea robusta.

214. QUERCUS DOUGLASII, H.& A.

Blue Oak, California Rock Oak.



TRANSVERSE SECTION.



RADIAL SECTION.

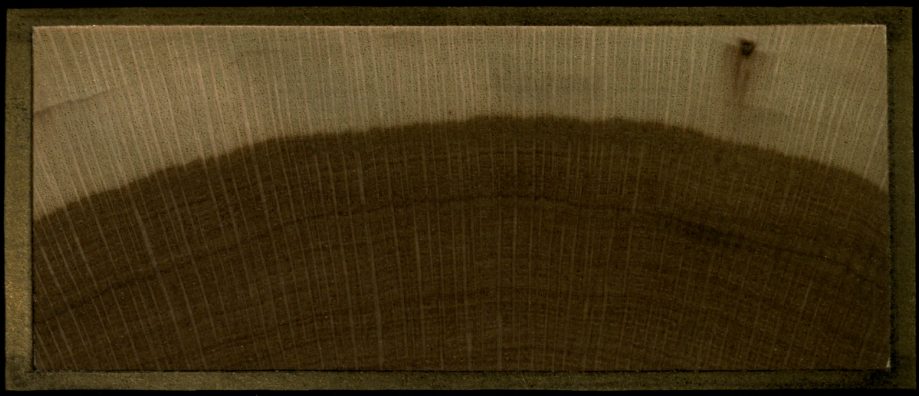
TANGENTIAL SECTION.

Ger. Blaueiche. *Fr.* Chêne bleu.

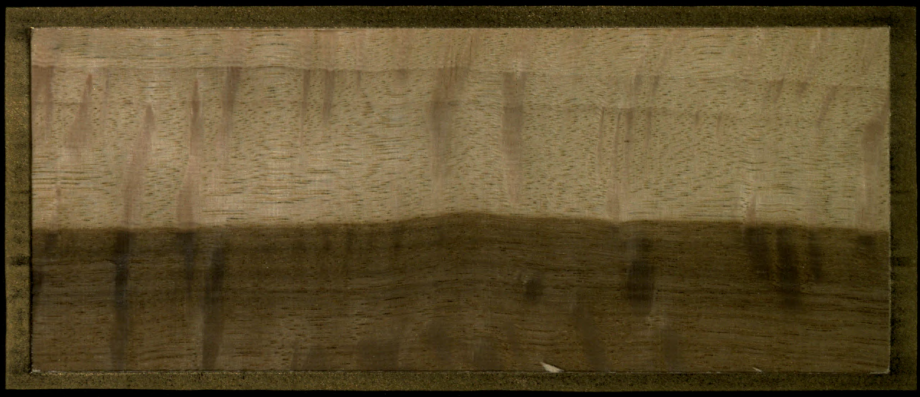
Sp. Roble azul.

214. QUERCUS DOUGLASII, H.& A.

Blue Oak, California Rock Oak.



TRANSVERSE SECTION.



RADIAL SECTION.

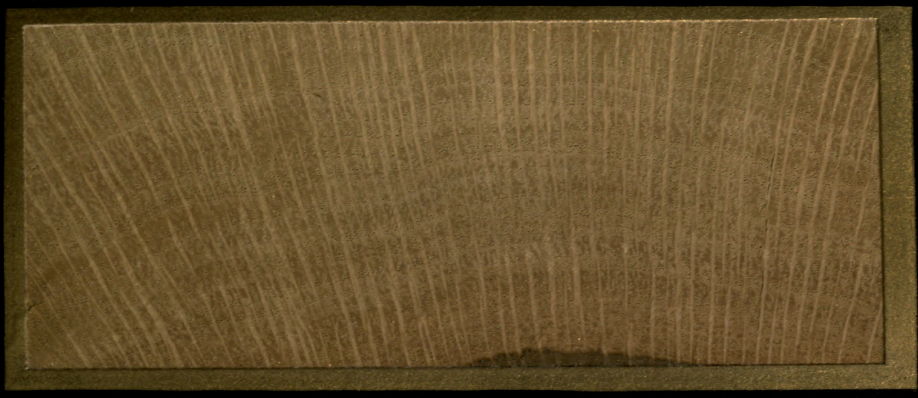
TANGENTIAL SECTION.

Ger. Blaueiche. *Fr.* Chêne bleu.

Sp. Roble azul.

215. QUERCUS ENGELMANNI, Greene.

Engelmann Oak.



TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

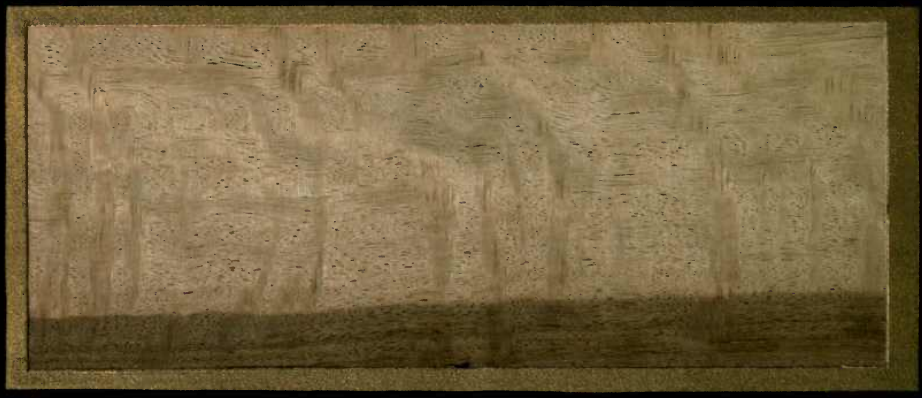
Ger. Eiche von Engelmann. *Fr.* Chêne d'Engelmann.

Sp. Roble de Engelmann.

215. QUERCUS ENGELMANNI, Greene.

Engelmann Oak.

TRANSVERSE SECTION.



RADIAL SECTION.

TANGENTIAL SECTION.

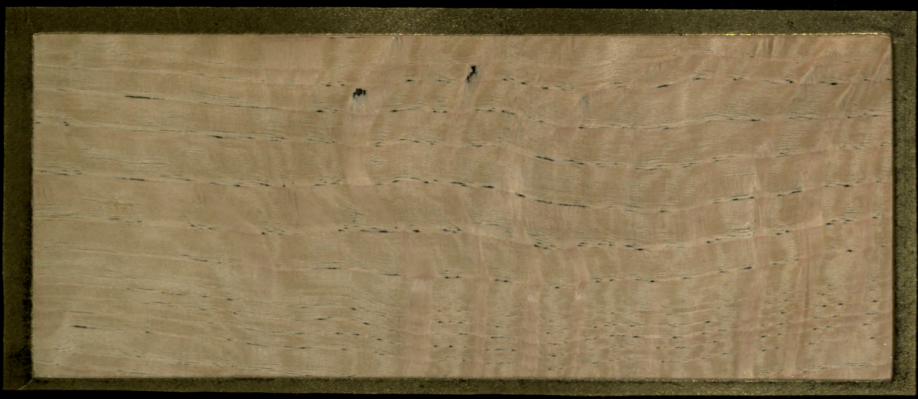
Ger. Eiche von Engelmann. *Fr.* Chêne d'Engelmann.

Sp. Roble de Engelmann.

216. QUERCUS MACDONALDI, Greene.

MacDonald Oak.

TRANSVERSE SECTION.



RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Eiche von MacDonald. *Fr.* Chêne de MacDonald.

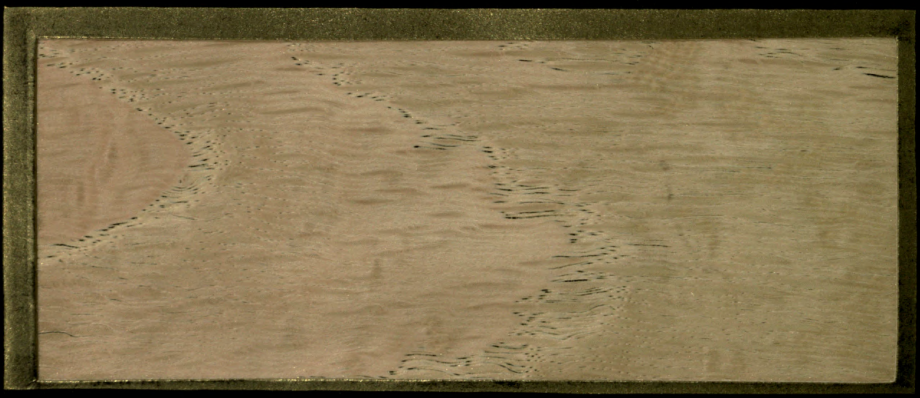
Sp. Roble de MacDonald.

216. QUERCUS MACDONALDI, Greene.

MacDonald Oak.

TRANSVERSE SECTION.

RADIAL SECTION.



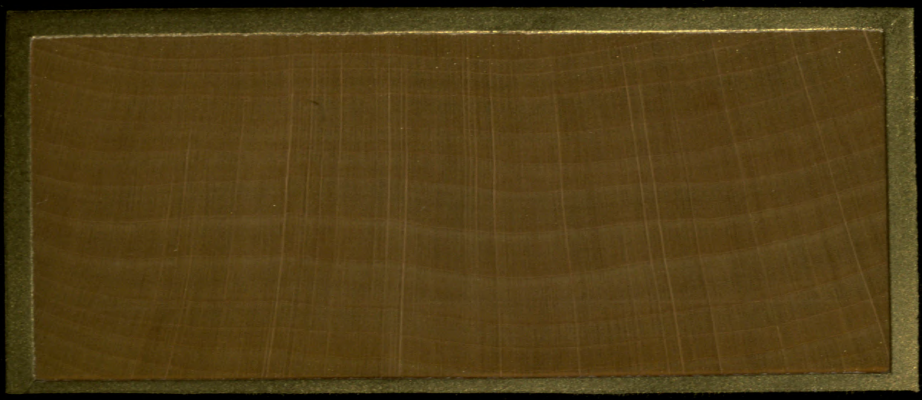
TANGENTIAL SECTION.

Ger. Eiche von MacDonald. *Fr.* Chêne de MacDonald.

Sp. Roble de MacDonald.

217. ALNUS OREGONA, Nutt.

Oregon Alder, Red Alder.



TRANSVERSE SECTION.

RADIAL SECTION.

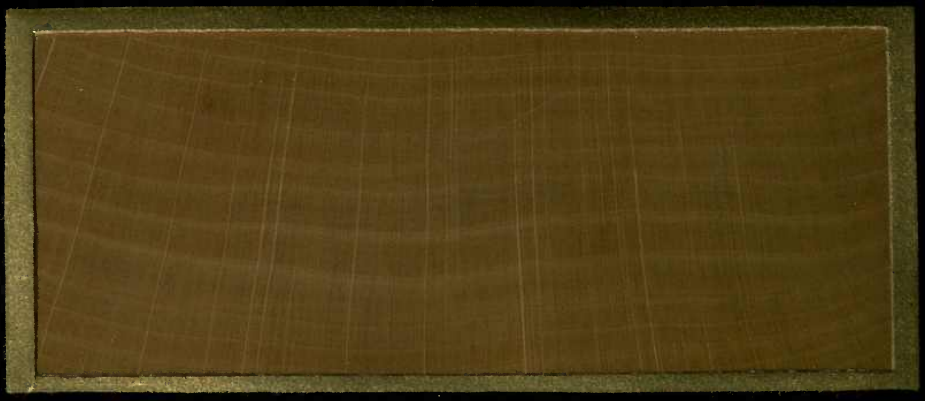
TANGENTIAL SECTION.

Ger. Oregonische Erle. *Fr.* Aune d'Oregon.

Sp. Aliso de Oregon.

217. ALNUS OREGONA, Nutt.

Oregon Alder, Red Alder.



TRANSVERSE SECTION.

RADIAL SECTION.

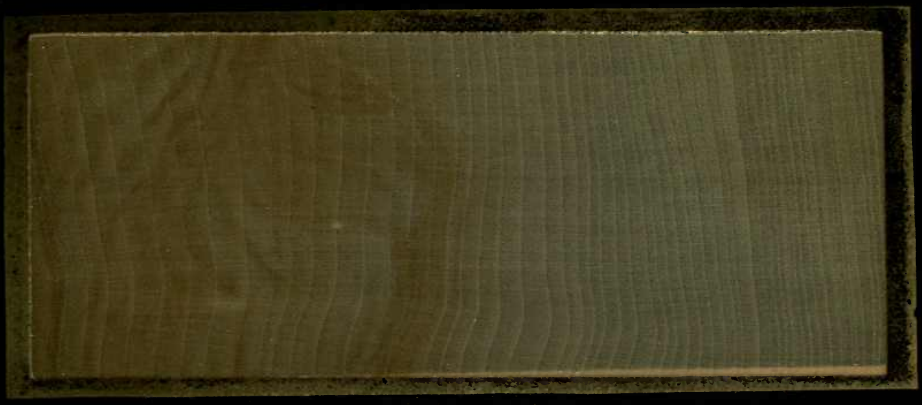
TANGENTIAL SECTION.

Ger. Oregonische Erle. *Fr.* Aune d'Oregon.

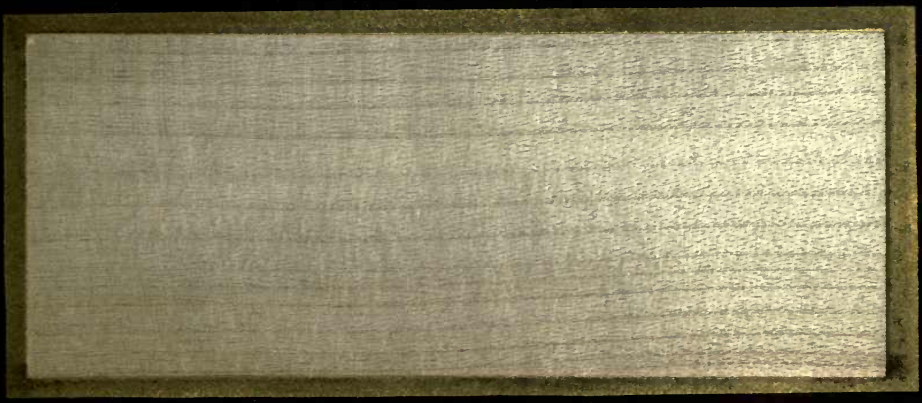
Sp. Aliso de Oregon.

218. POPULUS TRICHOCARPA, T. & G.

Black Cottonwood.



TRANSVERSE SECTION.



RADIAL SECTION

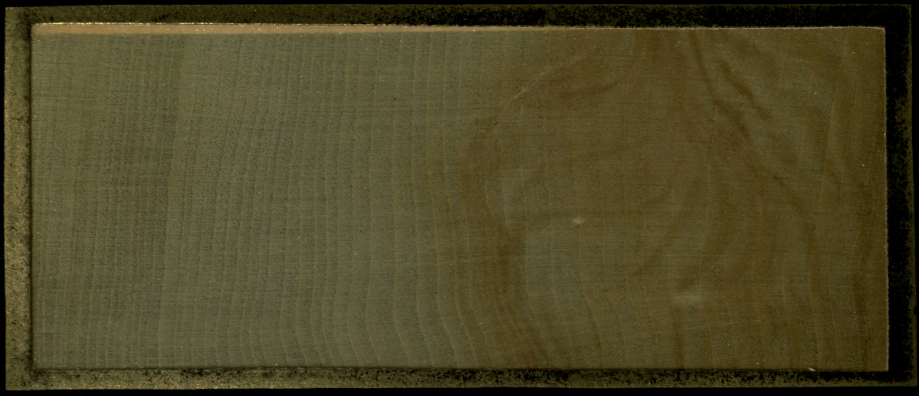
TANGENTIAL SECTION.

Ger. Schwarze Pappel. *Fr.* Peuplier noir.

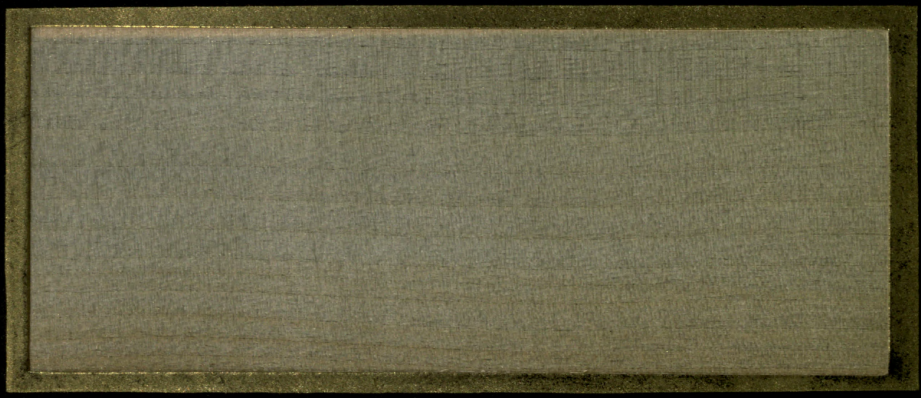
Sp .Alamo negro.

218. POPULUS TRICHOCARPA, T. & G.

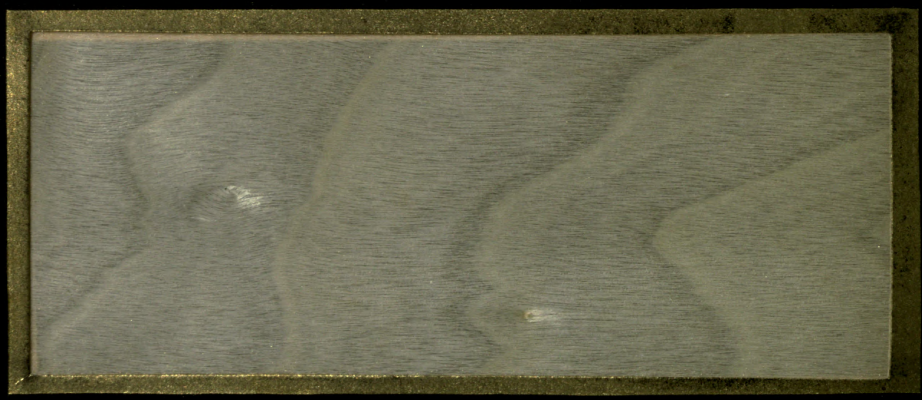
Black Cottonwood.



TRANSVERSE SECTION.



RADIAL SECTION



TANGENTIAL SECTION.

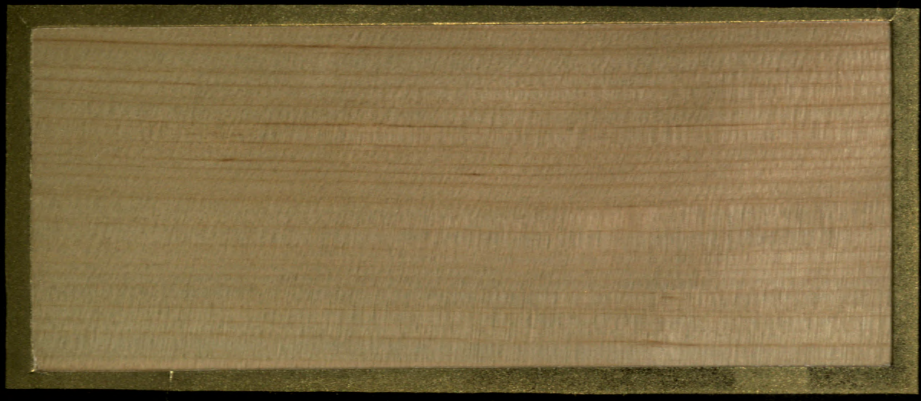
Ger. Schwarze Pappel. *Fr.* Peuplier noir.

Sp Alamo negro.

219. CUPRESSUS MACNABIANA, Murr.

Macnab Cypress.

TRANSVERSE SECTION.



RADIAL SECTION.

TANGENTIAL SECTION.

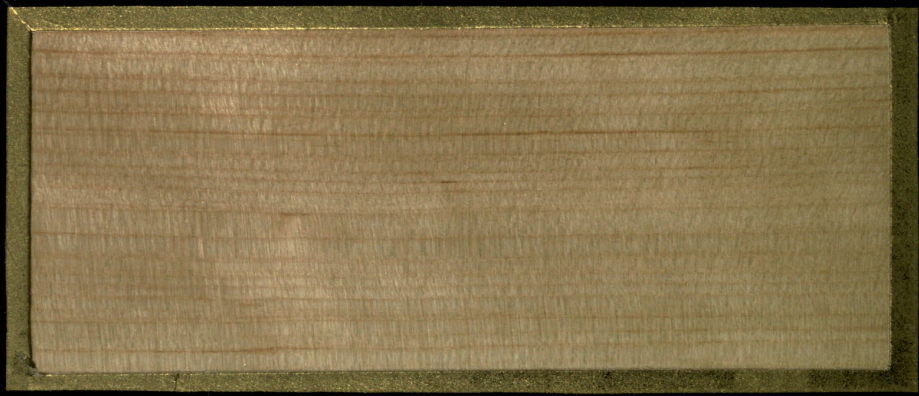
Ger. Cypresse von Macnab. *Fr.* Cypres de Macnab.

Sp. Cipres de Macnab.

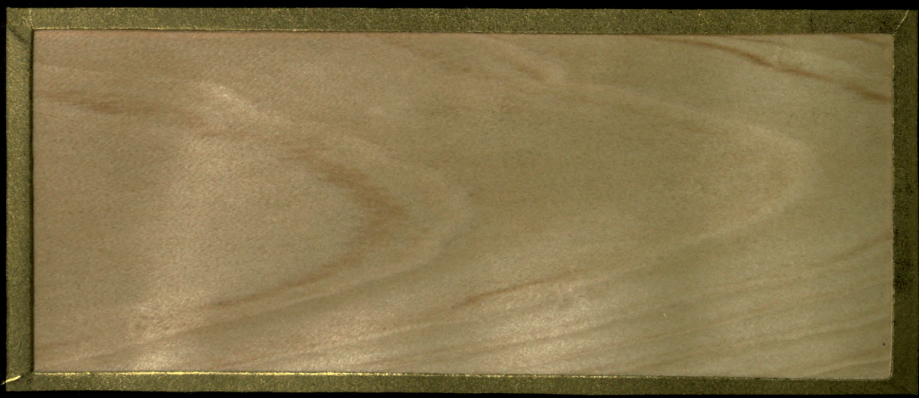
219. CUPRESSUS MACNABIANA, Murr.

Macnab Cypress.

TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Cypresse von Macnab. *Fr.* Cypres de Macnab.

Sp. Cipres de Macnab.

220. THUJA GIGANTEA, Nutt.

Giant Cedar, Northwestern Red Cedar, Shingle-wood.

TRANSVERSE SECTION.

RADIAL SECTION.

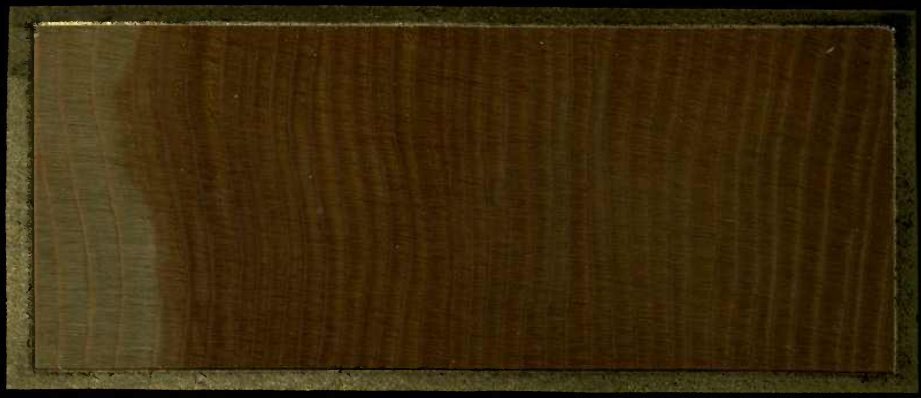
TANGENTIAL SECTION.

Ger. Gigantische Zeder. *Fr.* Thuya gigantesque.

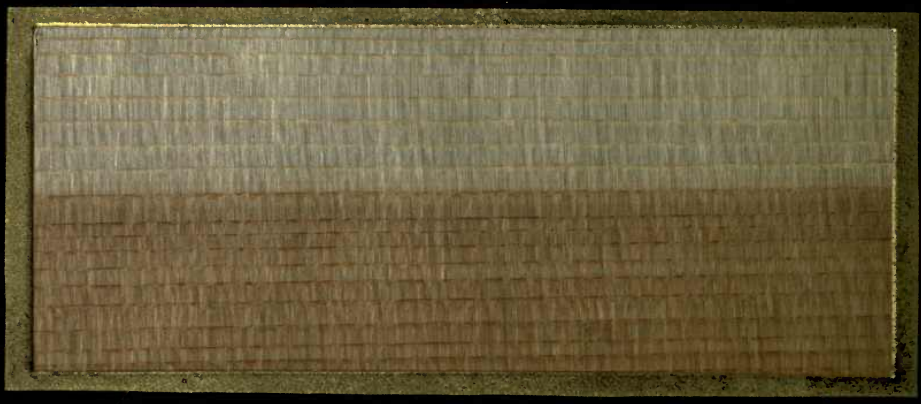
Sp. Cedro giganteo.

220. THUJA GIGANTEA, Nutt.

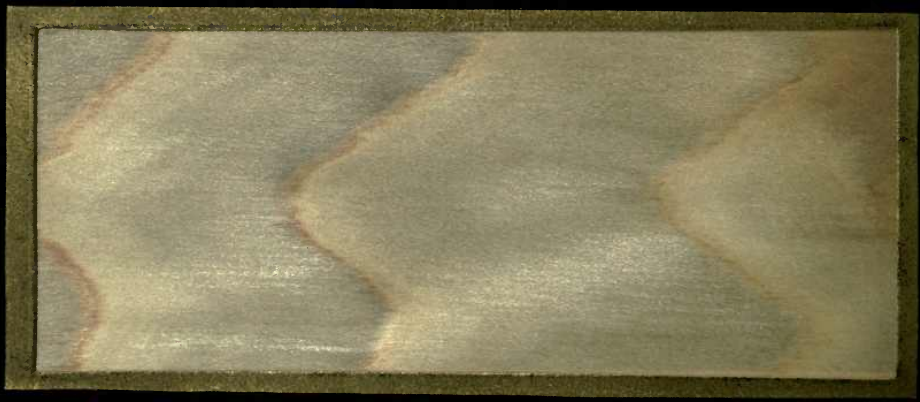
Giant Cedar, Northwestern Red Cedar, Shingle-wood.



TRANSVERSE SECTION.



RADIAL SECTION.



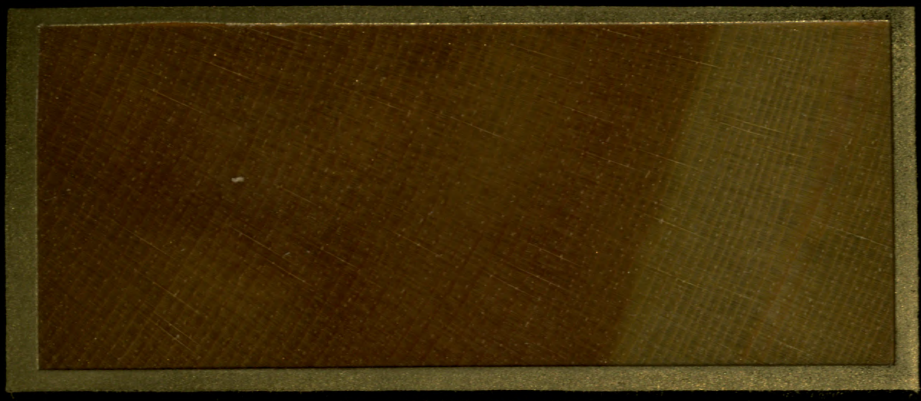
TANGENTIAL SECTION.

Ger. Gigantische Zeder. *Fr.* Thuya gigantesque.

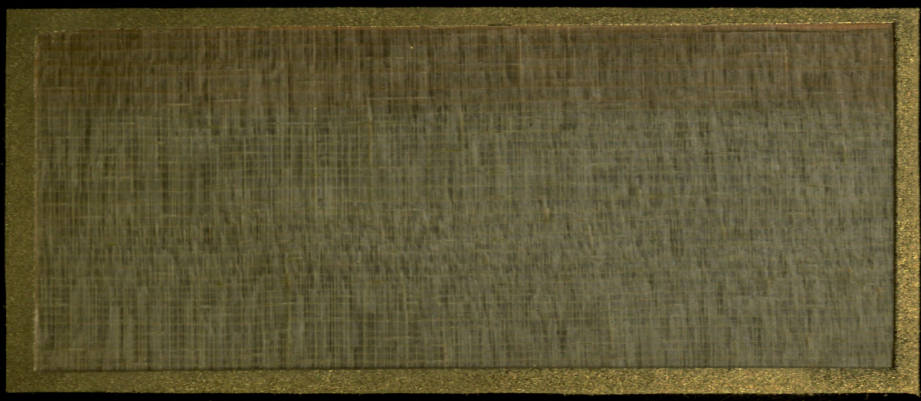
Sp. Cedro giganteo.

221. PINUS MONTICOLA, Dougl.

Mountain White Pine.



TRANSVERSE SECTION.



RADIAL SECTION.

TANGENTIAL SECTION.

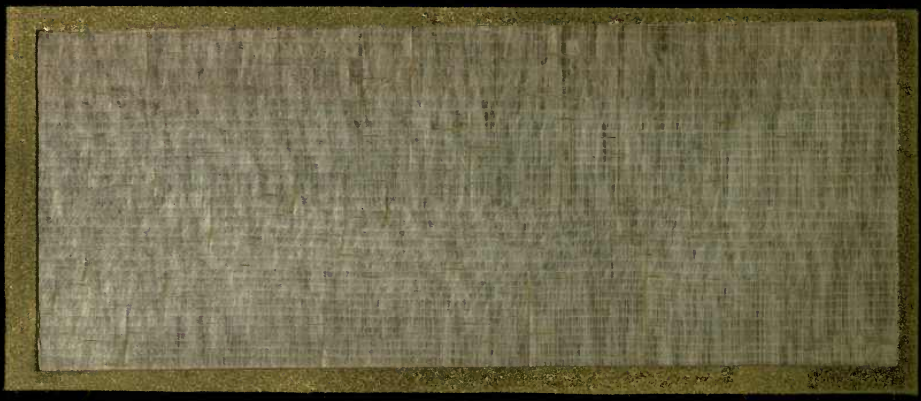
Ger. Gebirgige weisze Fichte. *Fr.* Pin blanc de la montagne.

Sp. Pino blanco de los montes.

221. PINUS MONTICOLA, Dougl.

Mountain White Pine.

TRANSVERSE SECTION.



RADIAL SECTION.

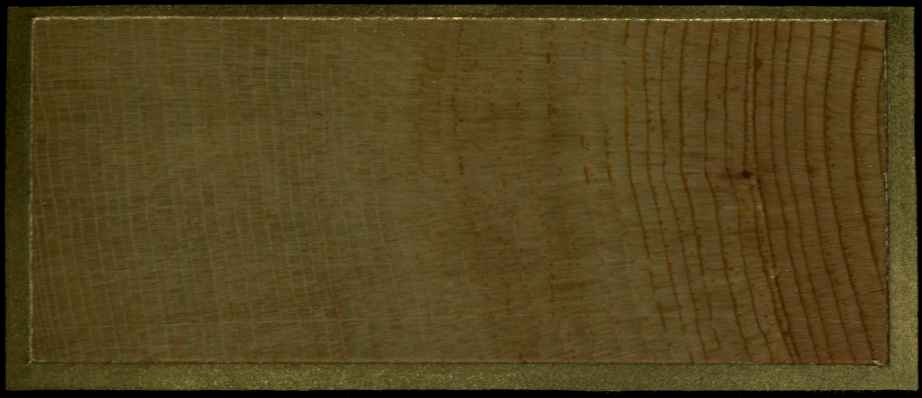
TANGENTIAL SECTION.

Ger. Gebirgige weisze Fichte. *Fr.* Pin blanc de la montagne.

Sp. Pino blanco de les montes.

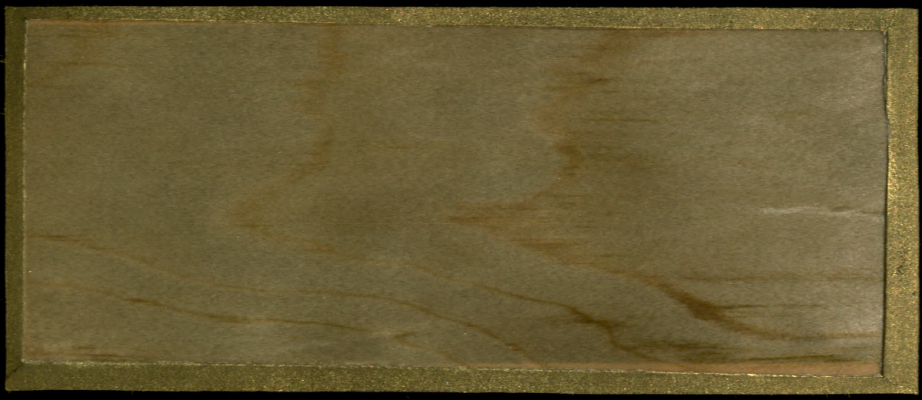
222. PINUS ATTENUATA, Lem.

Knob-cone Pine.



TRANSVERSE SECTION.

RADIAL SECTION.

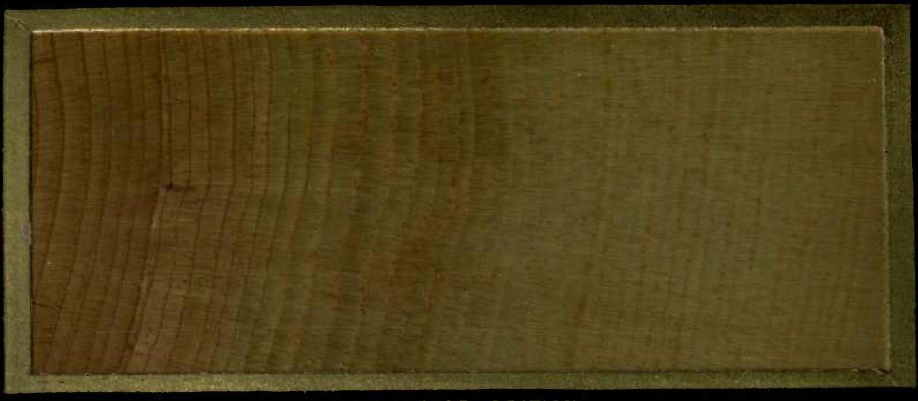


TANGENTIAL SECTION.

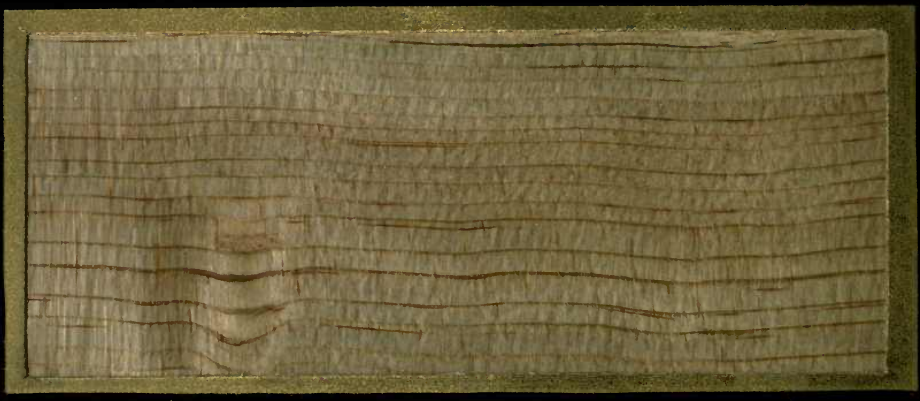
Ger. Fichte von engen Zapfen. *Fr.* Pin de cones étroits.
Sp. Pino de conos angostos.

222. PINUS ATTENUATA, Lem.

Knob-cone Pine.



TRANSVERSE SECTION.



RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Fichte von engen Zapfen. *Fr.* Pin de cones etroits.
Sp. Pino de conos angostos.

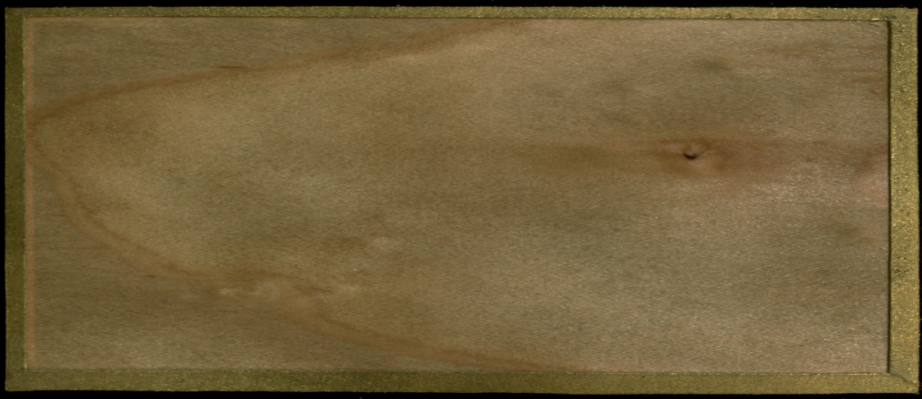
Published and Sections made by Romeyn B. Hough, B. A., Lowville, N. Y., U. S. A.

223. TSUGA HETEROPHYLLA, Sarg.

Western Hemlock.

TRANSVERSE SECTION.

RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Westliche Tanne. *Fr.* Peruche occidental.

Sp. Abeto occidental.

223. TSUGA HETEROPHYLLA, Sarg.

Western Hemlock.

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Westliche Tanne. *Fr.* Peruche occidental.

Sp. Abeto occ'dental.

224. ABIES GRANDIS, Lindl.

Great Silver Fir.

THANSVERSE SECTION.

RADIAL SECTION.

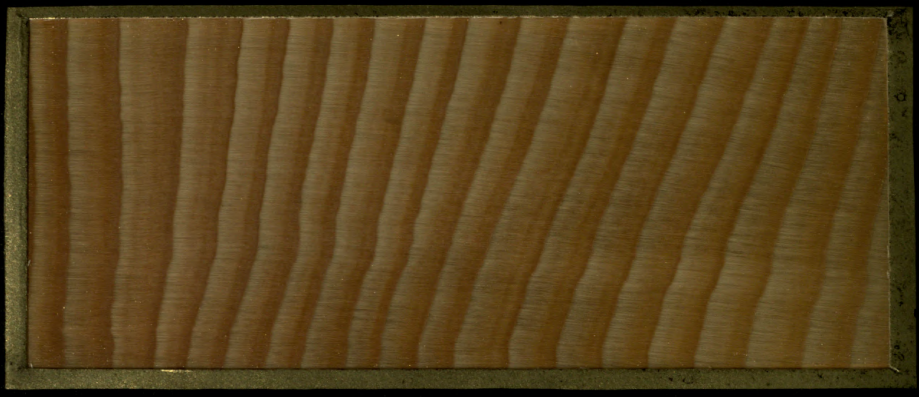
TANGENTIAL SECTION.

Ger. Grosze Tanne. *Fr.* Sapin grand. *Sp.* Abeto grande.

Published and Sections made by Romeyn B. Hough, B. A., Lowville, N. Y., U. S. A.

224. ABIES GRANDIS, Lindl.

Great Silver Fir.



TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Grosze Tanne. *Fr.* Sapin grand. *Sp.* Abeto grande.

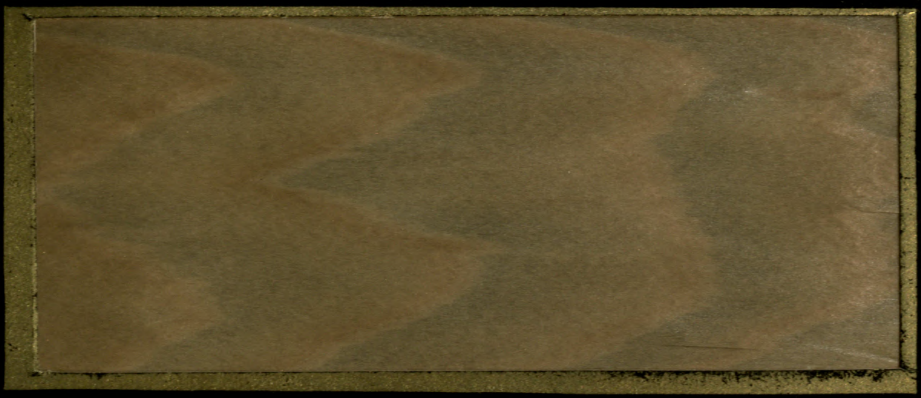
Published and Sections made by Romeyn B. Hough, B. A., Lowville, N. Y., U. S. A.

225. ABIES NOBILIS, Lindl.

Noble Fir, Oregon "Larch".

TRANSVERSE SECTION.

RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Erlauchte Tanne. *Fr.* Sapin noble. *Sp.* Abeto noble.

Published and Sections made by Romeyn B. Hough, B. A., Lowville, N. Y., U. S. A.

225. ABIES NOBILIS, Lindl.

Noble Fir, Oregon "Larch".

TRANSVERSE SECTION.

RADIAL SECTION.

TANGENTIAL SECTION.

Ger. Erlauchte Tanne. *Fr.* Sapin noble. *Sp.* Abeto noble.